

Chapter 2

Product and process development

DEFINITIONS

Product and Process Development (commonly referred to as Product Development) is systematic, commercially oriented research to develop products and processes satisfying a known or suspected consumer need. Product development is a method of industrial research in its own right. It is a combination and application of natural sciences with the social sciences – of food science and processing with marketing and consumer science – into one type of integrated research whose aim is the development of new products.

The most widely referenced normative product development models are those of Booz, Allen and Hamilton Inc. (1982) and that of Cooper and Kleinschmidt (1986). There are essentially four basic stages in these models for every product development process. These are:

- product strategy development;
- product design and development;
- product commercialization;
- product launch and post-launch.

Each stage has activities which produce outcomes (information) upon which management decisions are made (Figure 1). In practice, some of the activities performed in the product development process can be truncated, or some stages can be omitted or avoided based on a company's accumulated knowledge and experience.

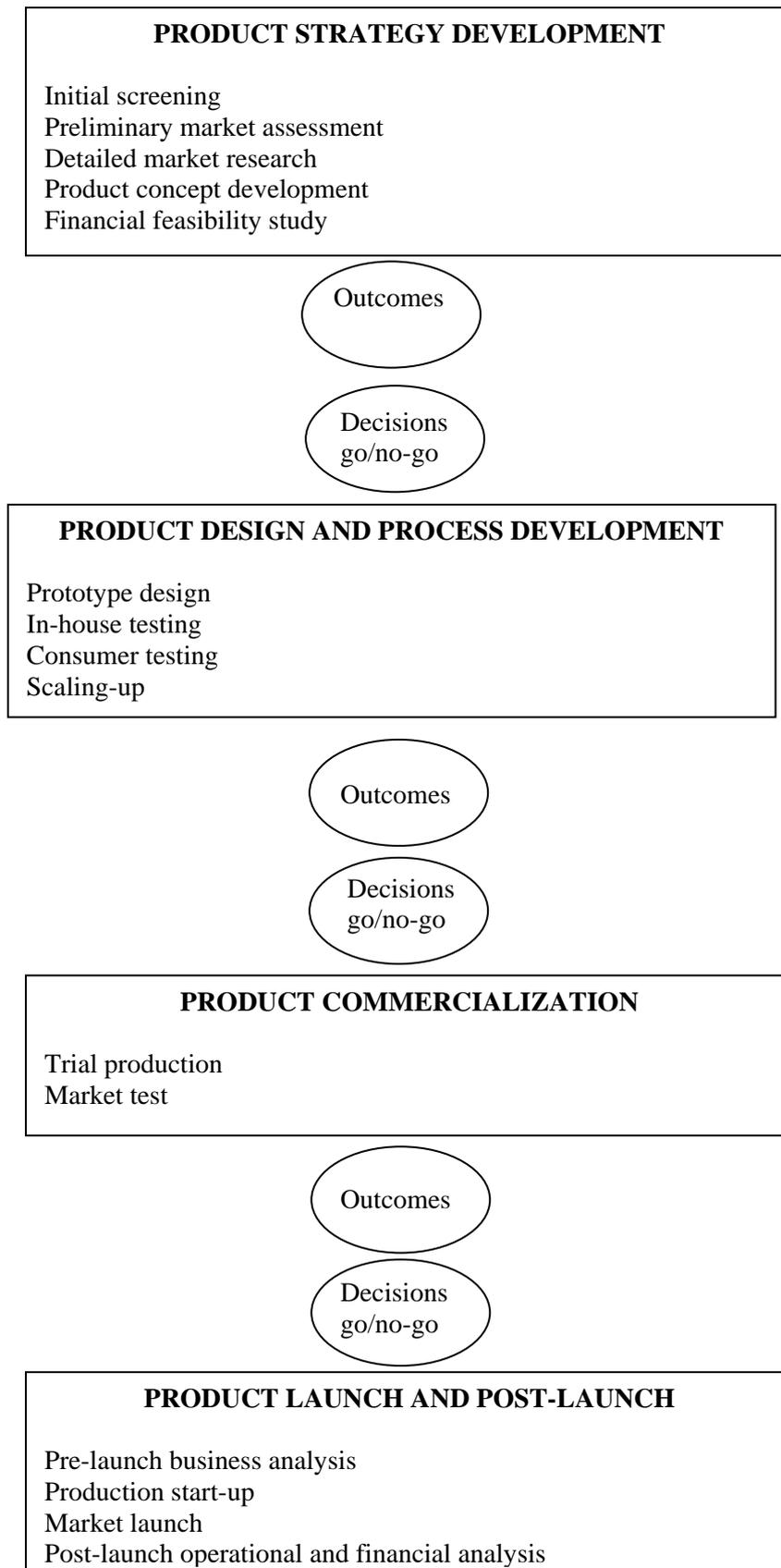
Having defined product development it is now necessary to examine the issue of what constitutes a new or innovative product. Newness of a product may be judged differently according to those who perceive it. In the context of consumer goods such as food products, there are three groups of actors: consumers, distributors, and producers. Each may have a different view of whether or not a product is new.

There are many ways to classify the degree of newness of a product. One useful example uses seven categories:

- creative products;
- innovative products;
- new packaging of existing products;
- reformulation of existing products;
- new forms of existing products;
- repositioned existing products;
- line extensions.

A more technical assessment has been given by Earle and Earle (2000). They defined the innovation spectrum as “new to the world”, “product improvements” and “cost reductions”. They then defined three broad levels of innovations: incremental, major and radical. Product platforms were then used to group similar products. Changes to products made within a platform are “derivative” changes. It is also possible through radical changes to form new platforms of products.

FIGURE 1
Schematic of the overall product development process



Source: Siriwongwilaichat (2001); adapted from Earle and Earle (2000).

Crucial to the discussion of product development is to recognise that “innovation” is contextual. The consumers’ perception of product newness depends on the location of the consumer and the types of food products currently or recently on the market. For example, Asian food products were new products in Western supermarkets in the early 1990’s, but they were well-established and traditional products in Asia. The distributors’ views on product newness will depend on the product range of the producers that they interact with and their knowledge of local and other markets. Similarly, food producers will perceive the newness of a product in the context of their product range.

The fact that a food product is not ‘new to the world’, does not diminish its potential importance to a consumer, distributor or producer. Using the example of Asian food products referred to above. The development processes used, the investments required, the challenge of introducing the Asian food products to a Western market, and the potential financial impact were no less important just because Asian foods had previously existed in Asia. A particular consumer, distributor, or producer will approach new products differently depending on whether they are either completely new to both the market and the producer (never-seen-before-products), or already exist in either the market or the producer (copying of or change from known products). This aspect was included in the classifications system of Earle and Earle (2000), given above. Siriwongwilaichat (2001) also captured this when classifying new products as “Innovative products – completely new to the market (ICNP)”, “Products – new to the company (PNC)”, “Value added products (VA)” and “line extensions (LE)”.

The challenge for product development is to develop a product which is acceptable to the target consumer. In the example of Asian food products given above, the specific flavours, ingredients and levels of spiciness used in Asian foods sold in western countries are normally significantly different to that found traditionally in Asia. Similarly, ice cream flavours found in Asia (e.g. coconut, mango, durian, corn) are not popular in western countries which normally feature chocolate, vanilla and strawberry flavours. Even countries of seemingly similar culture can have major differences. For example, Australians prefer mango flavours in their foods (such as cereals and muesli bars) whereas New Zealand consumers prefer berry fruits in similar products. A recent launch of coloured ketchup in USA was a tremendous success for Heinz, whereas the same launch in Australia and New Zealand was a major failure.

The key principle in product development, which differentiates this research from all other natural science research, is the mandatory need to ensure the development meets a consumer demand. Without a market, no matter how innovative a change, there will be no sales and the product is worthless.

A major feature which distinguishes food product development is the ethical considerations of producing a large volume of safe food for human consumption. This is coupled to the fact that food raw materials are labile, unstable and must be stored for prolonged periods of time prior to consumption.

Key points

1. Product development is systematic, commercially oriented research to develop products and processes satisfying a known or suspected consumer need.
2. There are essentially four basic stages in these models for every product development process. These are:
 - a) product strategy development;
 - b) product design and development;
 - c) product commercialization;
 - d) product launch and post-launch.
3. There are several systems for classifying food products on their newness. A comprehensive model is defined by Earle & Earle (2000). They defined the Innovation spectrum as “new to the world”, “product improvements” and “cost

reductions". They defined three broad levels of innovations, incremental, major and radical changes. Product platforms can be used to group similar products. Changes to products made within a platform are derivative changes. It is also possible, through radical innovations, to form a new platform of products.

4. The ultimate test of product development occurs in the market and a new product can only be considered successful if it is a market and financial success.

PRODUCT DEVELOPMENT IN THE FOOD INDUSTRY

The definition of product development emphasised that, no matter how innovative a change, without sales the product is worthless. To consider food product sales it is necessary to look to the retail sector; this sector is characterised by intense competition and the dominant position held by supermarkets in many regions of the world. There is competition not only for sales between retailers, but competition between food product suppliers to gain access to retail space. Supermarkets in Australia (population 19 million) and New Zealand (population 4 million) have around 12,000 to 25,000 food and beverage stock keeping units (SKUs) on their shelves. In the USA (population 283 million) and Europe (population 729 million), this number may extend to as high as 40,000. Typically in Australia / New Zealand, there are between 5,000 and 10,000 "new" products offered to these supermarkets each year (about 18,000 a year in the USA) and about 10% are chosen to be displayed on the shelves. New introductions to the shelves are almost always linked to the discontinuation of another product. Of the 500 – 1000 new products introduced by the supermarkets each year, less than 1% will still be on the shelves in 5 years' time (Baker 2002).

Even with the degree of competition to enter retail space described above, product failure rates are alarmingly high. A study by Hoban (1998) reviewed the degree of newness of products introduced in the USA food markets. It was estimated that over a prolonged period only 1 in 100 or 1 in 200 products were really new. They identified 1100 – 1200 products introduced a year that were innovative, equity transfer products (product with a strong franchise brand name) or line extensions. The majority (about 75%) were line extensions. The retailer would see around 20,000 new bar codes each year. After 39 weeks of launch, 33% were successful, 42% were still in distribution but declining and 25% had failed. Line extensions had a 28% success rate, whereas the other two types of "new" products had a 47% success rate.

Siriwongwilaichat (2001) found that in Thailand between 1996 and 1999 new food products launched could be classified as 9% "Innovative products – completely new to the market (ICNP)", 25% "Products – new to the company (PNC)", 25% "Value added products (VA)" and 40% "line extensions (LE)".

In a review article in Food Technology in May, 2005, Watzke and Saguy provided the following commentary about new products. Out of 24,543 new products that Ernst & Young and AC Nielsen researched in the USA, only 539 were innovative and just 33 were real market successes. Other sources show that failure rates range from 48% (Dornblaser, 1997), 67 - 72% (Prime Consulting Group, 1997; Theodore, 2000) and 99% (Morris, 1993; Sloan, 1994).

The food retail sector places a vast array of products before consumers, but household purchasing patterns appear to be relatively stable. In the USA an average supermarket has about 40,000 SKUs, yet an average family gets 80-85% of its needs from just 150 items. A supermarket shopping exercise takes on average 24 minutes and the buyer would scan 910 SKUs. A survey in the USA last year revealed the majority of shoppers prepared a list prior to shopping and 72% indicated they would always, or often purchase the same items every time they go shopping for food. Only 26% would buy a wide variety of foods and brands.

Another factor related to supermarkets is that of 'own-labels'. Originally, own-labels were considered to be an alternative choice based on lower prices than branded products.

Nowadays, supermarkets' own-label products compete on quality, technology and packaging with manufacturers' leading brands and they take an increasing share of the market (Martinez & Briz, 2000). The competition from own-labels has caused food manufacturers to focus on specific product lines where they have inherent advantages. Firm concentration is particularly evident for those products where the manufacturer's brands are popular, such as in soup, breakfast cereal, and baby food. High-value brands have often been built on the basis of an innovative product, or range of products, that was particularly successful.

Major supermarkets make extensive use of customer loyalty schemes in which they reward customers for their patronage. However, these schemes also enable supermarkets to record what people are buying, which in turn gives them the capacity to do two other things. First, they can adjust the stock on the shelves to suit the buying preferences of the location of each store. Second, they have a database of consumers that is several orders of magnitude larger than can be managed by an individual company undertaking product development. If they choose to, the supermarkets can influence the food product development process by closing the information loop back to food product developers, such that products are refined according to customers' tastes.

A trend towards smaller, more frequent shopping trips and increased sales of instantly gratifying things such as ready meals has been noted by many commentators. This has often been attributed to the increasing number of consumers who are professionals with little time and plenty of money. But the shift is too marked to be explained by demographics alone. Thus, the range of products on sale is driving a change in consumption habits (Economist, 2005).

It is notable that the efforts of supermarkets tend to support incremental change innovation. Development of radical products is, by definition, based on an anticipated consumer need rather than a present defined need. Therefore, information on existing consumption patterns and tastes does not give direct assistance to the development of radical products.

In spite of food industry efforts to create a more exciting and interesting food culture and new food experiences, there seem to be ever-longer periods between great innovations in the food industry. One simple reason could be that the food industry is low-tech¹; it is an industry in which it is difficult to distinguish between products. There are few barriers to market entry and it is hard (though not impossible) to use patents or other forms of intellectual property rights in the food sector. So, product characteristics are copied by competitors, who produce me-too products (Tetra Pak, 2004). This low rate of radical change, coupled with the high failure rate of food products following market launch implies that the methodology for new food product development urgently needs to become more focused, quantitative, rapid and knowledge based. Many analyses have focused on developing models for industrial product outcomes, but food products have been neglected (Stewart-Knox & Mitchell, 2003). Reviews of literature and discussions with industry staff indicate that no one company remains a bench mark of "best practice" in product innovation in the food industry. One conclusion that might be drawn from this is that success is highly dependent upon the calibre of staff and the serendipity of the consumer.

An article in the May 2005 issue of *The Economist* spoke of a "crisis of creativity". The article reported that food firms should invest more in research and development (R&D) according to the head of a North American consumer-products practice. Personal-care companies spend an average of 2.6 percent of sales on R&D, while food and beverage companies only spend 1.6 percent. It was argued that this is a reason for the low number of real innovations, besides the fact that there is less money available for upgrading this low-tech industry into a more high-tech industry. Yet opportunities do exist; currently functional foods and drinks are seen as the greatest opportunity to differentiate and protect

¹ Low-tech industries are usually defined as industries with a low R&D component [Dietrichs, 1995]

products and ingredients with patents in high income countries. In the future, it may even be possible to visualise ingredients and foods that can be tailored to consumers' individual genetic properties, with the charting of the human genome in 2001.

One important view of innovation relates to the degree of innovation that is expected. Previously this has been discussed by the authors in terms of "newness" of a product. The majority of food innovations in the last 20 years have been incremental changes; in other industry sectors this is called "continuous innovation". Such innovation takes place within existing infrastructures and builds on knowledge in existing markets without challenging the underlying strategies and assumptions. It is worth noting that some published literature describes true innovation in the food industry as being in its hey-day during the 1960s and 1970s. This was when really novel food products were introduced and companies (such as McDonalds, Proctor & Gamble, General Foods, etc.) were regarded as the leading innovators of all industries at the time. Since then, the industry has become more introverted and the rate of truly novel foods has greatly declined. So has the profitability and corporate stability of these food organizations. McDonalds hold that they have not had a really novel food introduction since the burger in the 1970s. In the eyes of many, the novel innovators of today are the information technology companies and biotechnology groups.

In the last 5 years, some of the major food corporations have begun a new corporate strategy which has been termed "discontinuous" innovation (Miller & Morris, 1998). Discontinuous innovation involves a strategic jump to a totally new paradigm. This may involve novel technologies or ingredients, or the application of knowledge generated in one discontinuous area to another. A good example was the introduction of the MARS confectionary bar as an ice cream confectionary. MARS Corporation at the time had no skills in ice cream and the key ice cream manufacturers (Unilever and Nestle) had no skills in confectionary.

This sort of innovation may extend beyond specific food product identification in order to capture the value that the customer places on the product. In some cases food products can embody services and intangible benefits that complement the food product itself and add to its value. For example, in some markets, useful food storage regimes might involve drying foods, which need to be re-hydrated prior to use. This may be excluded in these markets because of the lack of availability of a safe and reliable water supply. The opportunity for a food company may be to provide the water supply for a community (market niche) and thereby gain the market opportunity and brand support for their dry foods. The key to discontinuous innovation is to identify the limits of knowledge or capability and extend the realm of possibilities beyond the obvious.

Key points

1. The retail sector ultimately determines the food products that are placed before the consumer. Within this sector supermarkets are particularly influential and have the capacity to change tastes and habits through the placement of products on shelves.
2. Reports of the newness of food products introduced and their success vary. In general terms only a very small proportion (1% to 2%) was radical changes and the majority (75%) were incremental changes ('me-too' products). Of the order of 75% of new food products were considered to be failures.
3. The strategy of supermarkets in introducing own-labels and in their ability to mine information from customer loyalty schemes is influencing product development in the food sector.
4. The food industry has a low R&D intensity as a % of turnover.

IMPORTANT FACTORS IN THE PRODUCT DEVELOPMENT PROCESS

The food industry appears to be populated with companies that prefer to re-develop existing products (incremental change), rather than create new products (radical change). Because food product development is considered a highly risky venture, the incremental

change strategy may be an attempt to increase success rates. Ironically, this apparently ‘safe’ approach perpetuates the problem of high food product failure, since truly innovative products are often more successful for a company (Stewart-Knox & Mitchell, 2003). However, there are some indications that certain factors may improve the number of the success rate in product development.

Three important factors that contribute to new product success were cited by Ilori *et al.* (2000). They were: marketing and managerial synergy, strength of marketing communications and launch effort, and market need, growth and size. These factors emphasize the role of marketing in the product development process. Other authors mentioned different factors, for instance market need satisfaction, unique and superior product, technological and production synergy and efficient development [Ilori *et al.*, 2000].

Tetra Pak (2004) found one or more of the following features typical of new products that succeed in the marketplace. Therefore, these could be used as criteria while screening ideas in the product development process:

- noticeable advantages for the consumer; the more the better;
- distinctive details that are important to the consumer;
- satisfy the consumers’ need for convenience, youth, better diet, less stress, perfect taste and variation;
- reliable brand;
- advertising breakthrough.

Ground breaking research during the late 1970s by Calatone and Cooper [Stewart-Knox & Mitchell, 2003] established that product success is dependent upon several factors during the product development process. The following factors were drawn from De Brentani & Kleinschmidt, 2004; and Stewart-Knox & Mitchell, 2003:

- the product being unique and superior;
- good understanding of consumer wants, needs and preferences;
- an open and innovative global NPD culture;
- commitment of sufficient resources to the NPD program;
- cross-functional teams;
- effective communication between product development team personnel;
- careful planning at the concept stage of product development;
- top management support;
- involvement of senior personnel;
- thorough market research;
- effective product marketing and launch.

Stewart-Knox & Mitchell (2003) found that understanding consumer needs and expectations and retailer involvement in product development were associated with product success. The involvement of outside agencies and technical expertise appeared important as well. However, there was disagreement on the degree to which the involvement of senior management determines product outcome. This apparent contradiction could reflect differences between the industry structure in each country, management culture, and the marketing environment. Although these factors seem consistent across different industrial sectors, there is evidence of cross-sector variation in the degree to which various practices impact on product outcome. For food product development, it appears that wide consultation with agencies and the involvement of expertise beyond the company has a positive impact on the success of food products. A

model that specifically considers food is the House of Quality approach, which is the first of four phases within quality function deployment (QFD). It also takes into consideration the sensory attributes of food. More information can be found in Costa *et al.* (2001). That food, not only the type of foods eaten, but also how food is produced, prepared and used, is deeply rooted in many cultures, implies that there is likely to be cross-cultural differences in terms of factors for success in food product development (Stewart-Knox & Mitchell, 2003). Therefore, success factors from one country do not necessarily translate well in another country (De Brentani & Kleinschmidt, 2004; Stewart-Knox & Mitchell, 2003).

On the other hand, factors that are associated with product failure were reported as:

- lack of market knowledge, e.g. due to poor market research;
- misdirected marketing efforts;
- dynamic and competitive markets;
- inadequate market size;
- resistance by marketing staff;
- technical problems;
- high prices;
- distribution problems;
- internal conflicts.

It seems that product failure is most closely linked to inadequacies within predevelopment activities (Stewart-Knox & Mitchell, 2003; Ilori *et al.*, 2000).