

# **Consumer research in the early stages of new product development**

**Issues and applications in the food domain**

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*Voor Muji en Rima*



# Abstract

New products that deliver added consumer value contribute significantly to the success of companies. In the numerous studies of new product performance over the years, consensus has developed that understanding consumer needs is of paramount strategic value, especially in the early stages of the product development process. During these early stages, the product has not yet been specified and the aim is to search for novel product ideas from a marketing and technological perspective. Despite their importance, several studies indicate that consumer research methodologies are underutilised in the early stages of new product development. The aim of this thesis is to analyse key issues and develop and illustrate appropriate consumer research methodology at early stages of the new product development process, as this is one of the most distinguishing characteristics of successful product development projects.

Consumer research can be confirmative in its focus of testing new product concepts before launch and in this way prevents unjustified investments. Consumer research can also be proactive in that it aims to identify new product ideas that deliver against consumer needs that are not yet fulfilled by products currently in the market. Successful new product development requires a balance between both types of consumer research. The research in this thesis focuses on the optimal application of both types of consumer research in the early stages of the development process, in particular in providing guidance in generating and validating new product concepts. In the first chapter, the importance of new product development is presented and key factors of success and failure are discussed. Specially, the need for consumer research in the early stages is considered and criteria for effective strategic consumer research are outlined.

*In chapter 2*, ten frequently used methods and techniques to uncover unmet consumer needs and wants are critically reviewed. Each of the following empirical chapters focuses on a specific aspect of the problems associated with selecting and implementing appropriate consumer research in the early stages of the product development process. *Chapter 3* presents a framework which allows obtaining relevant consumer and expert feedback in an early stage of the product development process. By systematically generating and rigorously screening a large set of product concepts both inside (experts) and outside (consumers) the company, the framework shows the extent to which experts and consumer agree about new product opportunities and in this way prevents that high potential opportunities are overlooked.

*Chapter 4* illustrates the problem of successful functional food innovation. This chapter provides insight in a number of strategic decisions that have to be taken in the early stages of the development process in relation to health claim formulation, segment determination and product selection. *Chapter 5* provides a comprehensive conceptual and empirical comparison of internal and external preference analysis. In addition to a comparison on statistical criteria, this study explicitly takes the end-user perspective into account by comparing both techniques on various end-user criteria. The final empirical chapter in this thesis (*chapter 6*) studies the added value of the innovation templates approach in generating and screening new product ideas. *Chapter 7* summarizes the results of the previous chapters and describes the limitations of this thesis. *Overall*, the results of this thesis contribute to the better recognition of the importance of consumer research in early stages of new product development and suggest methodologies that could support effective marketing-R&D interfacing early in the process.



# Voorwoord

De vroege fase in de ontwikkeling van nieuwe producten is van cruciaal belang voor het uiteindelijke succes van een product. Dit is echter geen makkelijke fase, omdat vele mogelijkheden nog open liggen en keuzes gemaakt moeten worden. Hetzelfde geldt voor het schrijven van een proefschrift. Het valt niet altijd mee om de juiste onderzoeksvragen te stellen en je weg te vinden door stapels wetenschappelijke artikelen. Doorzetten tijdens moeilijke momenten werpt echter wel zijn vruchten af. Het resultaat is een proefschrift waar ik trots op ben. Vele personen hebben hieraan bijgedragen, maar allereerst wil ik mijn dank en waardering uitspreken aan mijn promotor, prof. dr. ir. J.C.M. van Trijp. Beste Hans, op de afgelopen periode kijk ik met veel plezier terug. Je inspirerende en constructieve manier van begeleiden hebben me enthousiast gemaakt voor het wetenschappelijk onderzoek. Ik heb veel van je geleerd en hoop in de toekomst met je te kunnen blijven samenwerken.

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# Chapter 1

## Introduction

### 1.1 Introduction

Companies must develop new products to grow and stay competitive, but innovation is risky and costly. A great majority of new products never makes it to the market and those new products that enter the market place face very high failure rates. Exact figures are hard to find and vary depending on the type of market (industrial versus consumer) and product (high tech versus fast moving consumer goods). Moreover, different criteria for the definition of success and failure make it complicated to compare. However, failure rates have remained high over the previous decades, averaging 40% (Griffin, 1997). According to Crawford (1987), the average failure rate is about 35%. Later, Cooper (1993), a leading researcher in the field of new product development (NPD), estimates a failure rate in the order of 25-45%. A more recent study of ACNielsen (2000) showed that only one-third of all fast moving consumer goods (FMCG) introduced in 1998 in Dutch supermarkets can be considered successful. In this study success was defined as having a level of weighted distribution in supermarkets of at least 50% after one year.

Since the 1960s it became apparent that the high failure rates of new products justified research to examine the reasons for success and failure. Prior to the 1960s the development of new products was considered a technological linear process; new technologies and a proactive research and development (R&D) effort were believed to drive the success of products that were created (Poolton and Barclay, 1998). Later on it became clear that more factors played a role. The first studies on NPD performance showed that the market place played a major role in stimulating the need for new and improved products. Since the pioneering studies of Booz, Allen and Hamilton (1968), the success and failure of new products has been studied intensively. Much has been written about the most appropriate NPD practices, which can lead to product marketplace success. Success depends among other factors on the degree to which the new product successfully addresses identified consumer needs and at the same time exceeds competitive products. Unfortunately, although past research on NPD performance has shown that even the slightest improvements in an organisation's NPD process could yield significant savings (Montoya-Weiss and O'Driscoll, 2000), bringing successful new products to the market is still a major problem for many companies. Despite increasing attention to NPD, the new product success rate has improved

minimally (Wind and Mahajan, 1997). Cooper (1999) states: 'Recent studies reveal that the art of product development has not improved all that much- that the voice of the customer is still missing, that solid up-front homework is not done, that many products enter the development phase lacking clear definition, and so on.'

The key learning emerging from NPD performance analysis is that success is primarily determined by a unique and superior product and that the achievement of that is primarily driven by the effective marketing-R&D interfacing at the very early stages of the NPD process (opportunity identification). Hence, the paradox here is that while failure reasons (at strategy, process and product level) are quite well understood and documented, still a high proportion of new products fails. One reason for this may be that factors of success and failure have not been translated into meaningful guides for action. Consequently, companies still have problems with effectively and efficiently implementing the factors of success into NPD practice. Consumer research at the earliest stages of NPD that helps bridge marketing and R&D functions is crucial in this process. Miller and Swaddling (2002) argue that the shortcomings in the current state of NPD practice can be directly or indirectly tied with consumer research (or the lack thereof) done in conjunction with NPD. As this appears a major bottle neck, this thesis aims at developing and illustrating consumer research methods at the marketing-R&D interface.

The structure of this chapter is as follows. We begin with underlining the importance of NPD for the continued growth and health of companies. Next, literature concerning success and failure in new product development is reviewed. After that, we discuss the role and importance of consumer research in the NPD process, both at the early stages (consumer research for inspiration and focus) and at the later stages (consumer research for verification). Specifically, we consider the need for consumer research in the early stages and then explore in detail the criteria for effective strategic consumer research. Finally, this chapter ends with the definition of the aim, focus and outline of this dissertation.

## **1.2 Importance of NPD**

New products that deliver added consumer value contribute significantly to the success of companies. NPD is generally recognised as the basis for profitability and growth of most companies. Additionally, innovativeness of companies has a positive impact on economic growth (Porter, 1990). Eliashberg, Lilien and Rao (1997) report a survey among 154 senior marketing officers of US corporations. 61% of the respondents expect that 30% or more of their sales will come from new products within the next 3-5 years. This finding is consistent with the survey of 700 firms (60% industrial, 20% consumer durables, and 20% consumer nondurables) of Booz, Allen and Hamilton (1982) who found that over a five-year period new products accounted for 28% of these companies' growth. Hultink and Robben (1995) reported that new products introduced in the last five years generated 41% of company's sales and 39% of company's profits. Besides these benefits, NPD offers other benefits like the positive impact on company image, the opening up of new markets and the provision of a platform for further new products (Storey and Easingwood, 1999).

The need to develop new products is increasingly felt in light of turbulence in the environment. The causes of such turbulence are numerous and interdependent and include:

- expanding competition (more companies competing for the same market)
- increasingly demanding and knowledgeable consumers whose needs, expectations and taste rapidly change over time (Dougherty, 1990)
- rapidly changing developments in science and technology, for example biotechnology, information and communication technology and knowledge about the food-health relation (Capon and Glazer, 1987), and
- globalisation of businesses, including increased international competition (Wind and Mahajan, 1997).

All these discontinuities result in shorter and less predictable product life cycles and create new markets to deal with, which in turn lead to an increasing pressure to develop and launch new products.

### **1.3 NPD success and failure at product, strategy, and process level**

The importance of NPD for continued survival and competitive success, coupled with the high-risk activity that it is, makes it not surprising that the NPD process has received considerable attention in literature. New product performance has been shown to be a complex construct and many and diverse measures of success are used in NPD performance studies (Griffin and Page, 1996). The reasons for success and failure of NPD are heavily researched from several points of view. In the early years of new product performance analysis, innovations were examined from the point of view of either the factors associated with success, or those factors associated with failure. It was not until the 1970s that studies compared successful with unsuccessful innovations (Poolton and Barclay, 1998). Generally, a distinction can be made between 'generalist' and 'specialist' studies. Generalist studies are typically explorative in that they include a broad range of possible determinants of new product success and aim at identifying the most important ones (Gruner and Homburg, 2000). Well-known generalist studies include the work of Robert Cooper and his colleagues, which is considered to be pioneering in its extensive analysis of new product performance. Specialist studies focus on an in-depth analysis of a limited range of determinants.

Despite methodological differences there is now general agreement of the common characteristics of successful innovation. The determinants of success and failure of new product are typically situated at two different organisational levels: (1) *the project (product) level*, i.e. the way in which individual products are developed, and (2) *the strategic level*, relating to the way in which companies approach the development of new products in general. The strategic issues operate at the organisational level. They are not particular to one project, but instead exert an influence over every project (Hart, 1995; John and Snelson, 1988). Henard and Szymanski (2001) conducted a meta-analysis of the new product performance literature. Based on existing frameworks found in literature (e.g. Montoya-Weiss and Calantone, 1994), they developed a similar taxonomy of antecedents of new product

performance. Three of the four categories they mention (product, strategy, process and market place) are particularly of importance in relation to this thesis: product, strategy and process characteristics. We will explore each of these categories in turn.

### ***Product characteristics***

Many studies have found that the factor that best distinguishes new product success from failure is a superior product in the eyes of the consumer (Ottum and Moore, 1997). This product advantage refers to consumers' perception of product superiority with respect to quality, cost-benefit ratio, or function relative to competitors (Montoya-Weiss and Calantone, 1994). Research of Cooper and colleagues in the 1970s and 1980s, for example, uncovered that a unique and superior product was the single most important factor of NPD success. Superiority in science and technology generally enhances uniqueness of these winning products in that they offer unique features that are not available on competitive products. Products that deliver real and unique advantages to users tend to be far more successful than 'me too' products. Consumer understanding ensures that these products meet consumers needs better than competitive products (Cooper, 1993; Henard and Szymanski, 2001).

### ***Strategy characteristics***

The strategy of a company dictates how it will operate internally, and how it will approach the outside world. To be successful, NPD must be guided by the corporate goals of the company, and therefore there is a need to set clearly defined objectives for NPD projects (Cooper, 1984; Baker and Hart, 1999). Strategic characteristics of successful companies include dedicating resources to the NPD initiative, timing market entry, and capitalising on marketing and technological synergies (Henard and Szymanski, 2001). A common view of (product development) strategy is that success depends on whether the structure of the company matches its environment (Nyström, 1985). A major element of the new product strategy stressed in literature is the importance of 'proaction' rather than reaction, especially in turbulent environments (Hart, 1995). Product development strategies can be described in terms of reactive or proactive strategies. A reactive strategy is based on dealing with turbulence in the environment (e.g. changing consumer needs) as they occur, whereas a proactive strategy would specifically allocate resources in order to be first on the market with a product that a competitor would find difficult to achieve (Urban and Hauser, 1993). Another important factor is that top management should accept the risk involved in developing new products and support an entrepreneurial culture.



## ***Process characteristics***

Process characteristics refer to elements associated with the NPD process and its execution. NPD covers a broad range of activities. Many studies found that using a disciplined approach to developing new products increases information utilization and decision-making effectiveness and in this way improves the likelihood of success (Cooper, 1999). Most companies follow a formalised NPD process in which a series of activities move the project along from idea to launch (Griffin, 1997). Cooper (1990), for example, introduced the phase review or stage-gate system, a formal management approach to guide decision-making in subsequent phases of the NPD process. Other stage-wise new product process models are described by Pessemier (1966, 1982) and Urban and Hauser (1993).

One of the main conclusions of the many studies into new product performance is that predevelopment activities significantly improve new product success rates and is strongly correlated with financial performance (Cooper, 1988; Montoya-Weiss and Calantone, 1994). During this phase in NPD, new product concepts are generated and initially screened, prior to the actual development phase. It is a critical phase because deficiencies here result in costly problems in later stages of the NPD process. Product concepts are the basic components for NPD and concept selection decisions dictate all further development activity within a company (Roozenburg and Eekels, 1995). Cooper (1988) found that the quality of the execution of the predevelopment steps- preliminary market and technical studies, market research, business analysis and initial screening- is closely tied to financial performance. Basically, he showed that weaknesses in up-front activities seriously enlarge the chances for failure. In addition, he found that successful projects have over 1.75 times as many person-days spent on predevelopment activities, as do failures. Other authors claim as well that more time and resources should be devoted to activities that precede the actual development of products. Hise et al. (1989), for example, suggest that companies that use a full range of up-front activities (e.g. market definition, identifying consumer needs) have a 73% success rate compared with a 29% success rate for companies that use only a few of the up-front activities. Unfortunately, the early stages in NPD have come to be known as the 'fuzzy front-end of NPD' as it typically involves ill-defined processes, uncertainties and ad-hoc decisions (Cooper and Kleinschmidt, 1986).

A common theme in a number of studies is that consumer focus is essential for new product success (Rothwell et al., 1974; Cooper and Kleinschmidt, 1987; Griffin and Hauser, 1993). The core of successful NPD has been defined as: 'how to optimally exploit one's technological capabilities for the fulfilment of carefully selected market opportunities' (Van Trijp and Steenkamp, 1998). Characteristic of this definition is that no matter what technology is used, it has to be employed in products that deliver value in the eyes of the consumer. For the NPD process this implies that consumer needs need to be taken into consideration from the earliest stages on. This realisation has become critical as the result of many studies into new product performance (Brown and Eisenhardt, 1995; Calantone, Schmidt and Song, 1996). Poolton and Barclay (1998) reviewed the literature associated with the successful development of new products. They found that understanding consumer needs is one of the factors that has been cited by all the research studies as being critical to the success or failure

of innovations. The most successful new products are those that were developed to take advantage of a perceived and unfulfilled need rather than those that were driven by the availability of new technologies (e.g. Zirger and Maidique, 1990). Products come in and out of favour faster than the needs they serve. Patnaik and Becker (1999) point to the example of punch cards, magnetic tape, and floppy disks, which all successfully fulfilled consumers' need to store computer data. Because consumer needs endure longer than solutions, companies should focus on satisfying those needs rather than on producing a particular product.

One of the most investigated determinants of new product performance is the relationship between marketing and R&D in the NPD process. Many empirical studies have demonstrated that effective integration of marketing and R&D increases the likelihood of new product success (e.g. Griffin and Hauser, 1996; Hise, O'Neal, Parasuraman, McNeal, 1990). Gupta and Wilemon (1988) found that for a high degree of integration, R&D and marketing both need to be involved very early in the NPD process. Song, Thieme and Xie (1998) examined the relationship between new product performance and cross-functional joint involvement between marketing, R&D and manufacturing in 5 major stages of the NPD process. They found that especially during the market opportunity stage, where ideas are generated and screened, a joint involvement of marketing and R&D is associated with NPD success. Unfortunately, each discipline has a somewhat different view of the product development activity, which often turns into barriers to co-operation. Much has been written about these integration problems, in particular about the importance of effective communication (e.g., Griffin and Hauser, 1992; Moenaert and Souder, 1996). Research about the effects of cross-functional integration in the development of new products has demonstrated that good communication between functional disciplines is critical to innovative success (Moenaert and Souder, 1990; Kahn, 1996; Song, Thieme and Xie, 1998). High inter-departmental communication increases the amount and variety of internal information flow and, so, improves development process performance (Brown and Eisenhardt, 1995). Unfortunately, product developers often encounter difficulties in this translation process due to communication problems at the marketing-R&D interface and lack of guiding research methodology.

#### **1.4 Role and importance of consumer research for opportunity identification in NPD**

In the numerous studies of new product performance over the years, agreement has developed that understanding consumer needs is of greatest strategic value, especially in the early stages of the NPD process. During these early stages, the product has not yet been specified and the aim is to search for novel product ideas. Successful NPD strongly depends on the quality and quantity of new product ideas. Presumably, consumer research should improve the quality of new product ideas. Yet, many companies do not carry out consumer research or do not use the resulting information. Many reasons exist why consumer research is not fully used for opportunity identification. Therefore, the last section discusses the key requirements for effective consumer research in the opportunity identification phase of NPD.

##### ***Use of methods in NPD practice***

The importance of understanding the consumer has increased over time. In the past, many companies succeeded without relying on knowledge about consumers' preferences and behaviour. Burton and Patterson (1999) state that until the middle of the 20<sup>th</sup> century, innovation was based on what manufacturers could and wanted to supply. The majority of new products resulted from technology push innovation, which means that the development of these new products was driven by a technological advance or invention. Later on, the post-war consumer and manufacturer boom led to growing competition between products. Simply supplying products became insufficient to maintain competitive advantage. Hence began the systematic investigation of consumers to discover what they wanted and what was most important to them. In this market pull model of innovation, it is suggested that companies should focus on the markets they serve (Kohli and Jaworski, 1990; Narver and Slater, 1990). Since that time, many methods and techniques have been developed to help product developers improve the quality of their decisions. The availability of these methods and techniques, however, does not mean that they are generally accepted and used in the NPD process. Wind and Mahajan (1997) argue that despite the widely accessible research and modelling approaches for NPD, many are not widely employed. Nijssen and Lieshout (1995) investigated the use of methods and models for NPD within a sample of small Dutch industrial companies. They found that for a large set of NPD methods, the awareness by name was only 30% and the awareness by content was 57%. About half of the companies which are aware of these methods by content also apply them, resulting in an overall penetration level of 30%. Mahajan and Wind (1992) assessed the role of NPD tools and techniques in supporting and improving the NPD process in the USA. They investigated a sample of Fortune 500 firms in the USA. In general, the use of NPD methods is not widespread. Besides their low use, many methods are not used in a focused way. Instead of their intended use for specific stages (e.g. idea generation, product optimisation), practitioners apply them to other stages and problems.

### ***Causes for non-use of consumer research in opportunity identification***

Different studies have found various reasons why information about consumers is not gathered, shared or used in the NPD process. For example, a stream of research initiated by Deshpande and Zaltman (1982, 1984) investigated the use (or non-use) of marketing research information by managers. In this section, the most frequent reasons why consumer research is poorly applied are discussed.

#### *Consumer research lacks credibility*

A widespread belief among practitioners is that consumers cannot be trusted in their opinion. Several studies have shown that it is difficult to predict final consumer behaviour based on consumers' expressed attitudes towards products or certain issues. Nijssen and Lieshout (1995) found that users of NPD methods mention this shortcoming of forecast inaccuracies. Moreover, users mention as well that methods are not able to capture the complexity of the market place. Another problem that plays in NPD is that consumer research is often part of marketers' responsibility in a company. It is well known that both marketing and R&D professionals do not always consider each other's information to be credible (Song, Neeley and Zhao, 1996). Marketers are often viewed as 'easy talkers' by R&D personnel, as relying too much on intuition rather than on hard facts (Gupta, Raj and Wilemon, 1985; Moenaert and Souder, 1990). If people perceive information as less credible, it means that they perceive the quality to be lower, and this will result in lower information utilisation.

#### *Consumer research does not help to come up with innovative new product ideas*

Various studies have found that the key determinant of new product failure is an absence of innovativeness - the extent to which a new product provides meaningful unique benefits. Not much confidence, however, exists among product developers that consumer research can provide a valuable contribution in the search for new and improved ways of satisfying consumers' needs. Although it is generally believed that listening to 'the voice of the consumer' is important, the precise way of 'listening' is not always clear. Effective use of consumer research for this purpose has been identified as a problematic area, because it is unsure what to ask consumers (Ortt and Schoormans, 1993; Ottum and Moore, 1997). An often-heard argument is that asking consumers what they want is useless, because they do not know what they want (Ulwick, 2002). Moreover, the majority of available methods focus on evaluation of products (Wind and Lilien, 1993). In these methods, products (ideas) are presented to a sample of consumers and evaluations are collected. These evaluations are used to optimise the product or to screen and select from different product ideas, ultimately ending up with the product idea with the highest likelihood of market success (Ozer, 1999). However, these methods can be considered as reactive of nature in their use in the early stages. They constrain the researcher in the elicitation of unfulfilled consumer needs, because consumer input is restricted to responses to an already existing concept or product. A risk of

relying on them solely is that they are likely to give product developers only 'me-too'-ideas, which hardly excite the consumer. Burton and Patterson (1999) point to this problem by stating that most consumer research only attempts to build on existing and often already fulfilled needs of consumers. Consequently, the results of this kind of consumer research do not exceed common-sense knowledge and hence is consistent with what practitioners already take to be true. Smith (2003) claims that this typically results in a 'So what, I already suspected that'-reaction on the part of the receivers of the results. In case consumer research does not exceed the intuition of end-users and solely reaffirms existing beliefs, it tends to be less used. Moreover, many studies are carried out to increase the saleability of a decision. Such studies are designed after a decision has been made to gain support rather than to provide a basis for the foundation of new product ideas (Day, 1994).

#### *Consumer research delays product development process*

Product life cycles are becoming shorter, which leads companies to reduce the time it takes to introduce new products at the market. Being early is generally believed to provide a significant competitive advantage. Companies that take too long in bringing new products to the market run the risk that others will get there first, or that consumer needs and wants will change. Consumer research is time-consuming and extends rather than shortens the NPD process. Moreover, consumer research requires additional resource investments (Miller and Swaddling, 2002).

#### *Consumer research lacks comprehensibility*

Consumer research must often be used by both marketing and R&D. Both marketing and R&D employees often complain that they have difficulty understanding each other. One of the reasons for this misunderstanding is that marketing has its own set of technical terms, and so has R&D (Moenaert and Souder, 1990). As a result, consumer research can be difficult to comprehend. Comprehensibility of information is the ease with which the receiver can decode and fully and unambiguously understand the information (Moenaert and Souder, 1996). For instance, Dougherty (1992) found that individuals from different functional departments understood different aspects of product development, and they understood these aspects in different ways. The difference led to varying interpretations, even of the same information.

### *Consumer research lacks actionability for R&D*

Information will be used if it is perceived to be relevant for the task for which the receiver is responsible (Moenaert and Souder, 1996; Madhavan and Grover, 1998). Both marketing and R&D professionals need consumer information that is closely linked to their own task in the development process. Marketers generally need information about key drivers of consumer choice for the development of effective communication, product positioning and segmentation strategies. R&D professionals, in contrast, need very concrete information about how consumer-desired product benefits translate into target values for technical development (Shocker and Srinivasan, 1979). R&D employees often complain that consumer research provides insufficient *actionable* and detailed information about consumer requirements and does not understand key issues about product development (Gupta, Raj, Wilemon, 1985). As a result, they may reject the information, lose interest or produce their own information on desired product features with the risk that the new product will not be entirely compatible with the actual requirements consumers have (Bailetti and Litva, 1995). This need for actionable information is becoming more important than it was in the past, because individuals often feel overwhelmed by the huge amounts of information available.

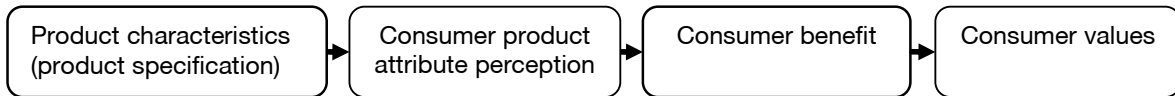
### ***Requirements for effective consumer research for opportunity identification in NPD***

By definition, innovation consists of doing something new (Baker, 1992). Hence, consumer research for opportunity identification reflects a more creative, pro-active side of product development as a complement to confirmative research. Unfortunately, most NPD methods focus on solutions to consumers' current problems and limit themselves to continuous innovation (Wind and Mahajan, 1997). The question is: how can consumer research help to identify opportunities and develop really new products? The difficulties that consumers have with expressing their needs and evaluating the potential of new products do not imply that consumer research should be left out. It does, however, pose special challenges to consumer research. Effective consumer research for opportunity identification in NPD distinguishes itself on the following characteristics.

*First*, effective consumer research for opportunity identification must be comprehensive in that it provides a detailed insight into the relation between product characteristics and consumers' need fulfilment and behaviour. Consumer research for NPD is often thought of as existing of historical purchase information or product evaluations. However, understanding consumer behaviour encompasses much more than just getting insight into how consumers evaluate and purchase products and services (Jacoby, 1979). Sheth, Mittal and Newman (1999) define consumer behaviour as all mental and physical activities undertaken by consumers that result in decisions and actions to pay for, buy, and use products and services. For consumers to decide to buy a product they must be convinced that the product will satisfy some benefit, goal, or value that is important to them (Gutman, 1982; Walker and Olson, 1991). To develop a superior new product, consumer research needs to identify consumers' product attribute perceptions, including the personal benefits and values that provide the

underlying basis for interpreting and choosing products (figure 1.1). As such, it makes a number of key considerations explicit. This provides a common basis for the different functional disciplines involved in the NPD process. In addition, it makes clear which crucial factors affect consumer perceptions, preferences and choices, and what trade-offs need to be made.

**Figure 1.1: Relation between product characteristics and consumer values**



*Second*, effective consumer research for opportunity identification helps to identify really new product ideas anticipating consumers' future needs and desires. Most consumer research methods work well in understanding consumer preferences among existing products, but are less appropriate in identifying future needs that consumers cannot yet articulate. Several authors argue in favour of specific techniques that may be applied to overcome these problems (Ortt and Schoormans, 1993; Wind and Mahajan, 1997). For example, they recommend deriving consumers' future needs by observing consumers in their own environment. The basic premise of the 'empathic design' method is that the richest information on consumer needs can be acquired by observing consumers in their own surroundings (Leonard and Rayport, 1997). Another example comes from Von Hippel (1988), who involved 'lead users' in the early stages of the NPD process. Lead users are consumers who have been dissatisfied with currently available products, but need a product to solve their problem. Lead users then develop their own solutions. As such, their present strong needs are assumed to become general in the market place months or years in the future. In contrast, the information acceleration approach (Urban, Weinberg and Hauser, 1996) tries to solve consumers' difficulty evaluating really new products by educating (potential) consumers on the capabilities of the innovation and its likely impact on their lives. Finally, Goldenberg, Mazursky and Solomon (1999) used a set of templates – regularities in the emergence of successful innovations- to come up with new product ideas. Based on two studies, Goldenberg, Lehmann and Mazursky (2001) conclude that templates significantly distinguish successful from failed new products in the marketplace, and hence are better able to identify product ideas that capture consumers' future needs. This is because over time, market changes leave traces in product configurations that can be identified as product-based trends. Those trends, crystallised as templates, provide the skeleton from which new successful future product ideas are generated.

All these examples have in common that they try to avoid complications like consumers' memory problems, lack of descriptive ability and lack of awareness of needs. In addition, they are not prescriptive but enhance product developers' creativity necessary for finding unique solutions.

*Third*, effective consumer research for opportunity identification is presented in an actionable form to make product development decisions based on consumer research. Characteristic of actionable knowledge is that findings and implications can directly be linked to the user's activities and practices (Menon and Varadarajan, 1992).

*Fourth*, effective consumer research for opportunity identification is executed on a continuous basis. It is not just enough to be able to describe the current state of the market in detail. The consumer's own circumstances may have changed or what used to be a valuable benefit isn't so important anymore. Competitors' offerings change as well, so it is not safe for a company to assume that they understand consumers' value perceptions for very long (Miller and Swaddling, 2002). An early understanding of changes in consumer behaviour makes it possible to anticipate market opportunities and respond before competitors do. In this way, consumer research helps to expand the time horizon of innovation. Rather than executed at an ad-hoc basis with a short-term focus, it should strongly and coherently be embedded in the total business process. This allows for systematic learning and anticipating on developments rather than only reacting to them (Hughes and Chafin, 1996).

## **1.5 Aim and scope of thesis**

The introduction of new products offers the opportunity for companies to increase its sales and so enhance both competitive position and potential for surviving. Although the development of new products can be rewarding, it is risky as well. The central task in NPD is to develop those products (characteristics) that deliver desired benefits for consumers. Unfortunately, this is more easily said than done. Many new products fail when launched in the market place. This is unacceptable from a financial point of view. The reasons for success are well researched and documented. In essence, development of a new product that is both unique and superior requires effective marketing-R&D interfacing throughout the NPD process. Breakthroughs in R&D generally enhance uniqueness whereas marketing/consumer focus will help ensuring superiority in consumer value perception. Moreover, several authors claim that the opportunity identification stage, where product ideas are generated and screened, is one of the greatest opportunities for improvement of new product success rates (Rosenau, 1988; Khurana and Rosenthal, 1998). Wind and Mahajan (1997) argue in their influential paper that most of the improvements of the NPD process would be most beneficial for activities dealing with the earlier stages of the NPD process. In successful NPD, a balance should be found between consumer research to minimise NPD risks (verify or test) and consumer research to identify opportunities by acquiring inspiration and focus (allowing creativity in the process). Numerous consumer research methods are available to understand consumer needs and wants for product development purposes. But despite the widespread recognition of the important role



that a focus on the consumer plays in NPD, most companies fail to use these methods in an appropriate manner. Product developers are still relying on gut-feel with respect to 'best practice' in NPD.

The aim of this thesis is hence to analyse key issues and develop and illustrate appropriate consumer research methodology at early stages of the NPD process, as this is one of the most distinguishing characteristics of successful NPD projects.

*Chapter 2* deals with the finding that consumer research for opportunity identification is often ignored or poorly executed. A major reason for this is that product developers do not know which methods are available, and have difficulty interpreting them because of the use of disciplinary terminology. Therefore, this chapter reviews and categorises ten of the most common methods in this area. It provides guidelines for the appropriateness of these methods in the NPD process based on the newness strategy of the NPD process (radical versus incremental innovation) and identifies which functional department (marketing versus R&D) the method should primarily support. As such, it attempts to provide a guide for product developers for incorporating the 'voice of the consumer' in early stages of the NPD process.

*Chapter 3* illustrates the problem of divergent perceptions of marketing and R&D functional disciplines on consumer needs and preferences. In the reported study, consumer and expert opinions are contrasted to understand where both groups agree and disagree.

*Chapter 4* considers the requirement of effective consumer research for opportunity identification that is comprehensive and provides detailed insights into the relation between product characteristics and consumers' need fulfilment and behaviour. In particular, it is examined how consumers evaluate health claims on functional foods that are equivalent in meaning, but differ in the frame in which they are presented. Health claims can stress the avoidance of negative end-states (e.g. preventing cardiovascular disease) or the achievement positive end-states (e.g. promoting a healthy heart). The experimental study reported in this chapter explores some important factors that drive consumers' evaluation of these health claims. In particular, it is hypothesised that such health claims are evaluated differently by different people depending on the strategic means that they have learned toward goal attainment.

*Chapter 5* studies one particular factor of success for consumer research in NPD, namely that information about consumer needs and preferences should be actionable and appropriate for the task for which the end-user of the method is responsible. The chapter deals with internal and external preference analysis, as both techniques are applied to obtain actionable guidance for the development of new products, both in terms of (food) technological product development and marketing. However, although internal and external preference analyses are based on the same data, they emphasise fundamentally different perspectives on this data. This study aims to provide a comprehensive conceptual and empirical comparison of internal and external preference analysis by critically comparing them on a set of statistical criteria and usefulness of product maps for end-users.

*Chapter 6* deals with the innovation templates approach of Goldenberg (2001), which is generally used to channel the idea generation or screening process into those new product ideas that have a higher probability of success. Unlike most NPD methods, the templates approach starts with an existing product and its characteristics rather than an understanding of

consumer needs. In this study, it is examined whether the use of the template approach is particularly relevant for complex and incongruent products, and less relevant for simple ones.

*Chapter 7* concludes this dissertation and provides a general discussion and suggestions for further research.

# Chapter 2

## **Consumer research in the early stages of new product development: a critical review of methods and techniques<sup>1</sup>**

### **Abstract**

Incorporating the 'voice of the consumer' in early stages of the new product development process has been identified as a critical success factor for new product development. Yet, this step is often ignored or poorly executed. This may be due to lack of familiarity on which methods are available, the use of disciplinary terminology, and difficulty in accessibility of papers on this subject. This paper reviews and categorises ten of the most common methods in this area, in terms of what their key features are, and what strengths, weaknesses and appropriateness are. We develop a classification scheme based on three performance dimensions with specific criteria: (1) stimuli used as cue for need elicitation, (2) task format, and (3) need actionability. We provide guidelines for the appropriateness of these methods in the new product development process based on the newness strategy of the development process (radical versus incremental innovation) and identify which functional department (marketing versus R&D) the method should primarily support.

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<sup>1</sup> This chapter is published as Van Kleef, E. Van Trijp, H.C.M. and Luning, P. (2005a). Consumer research in the early stages of new product development: a critical review of methods and techniques. *Food Quality and Preference*, 16(3), 181-201.

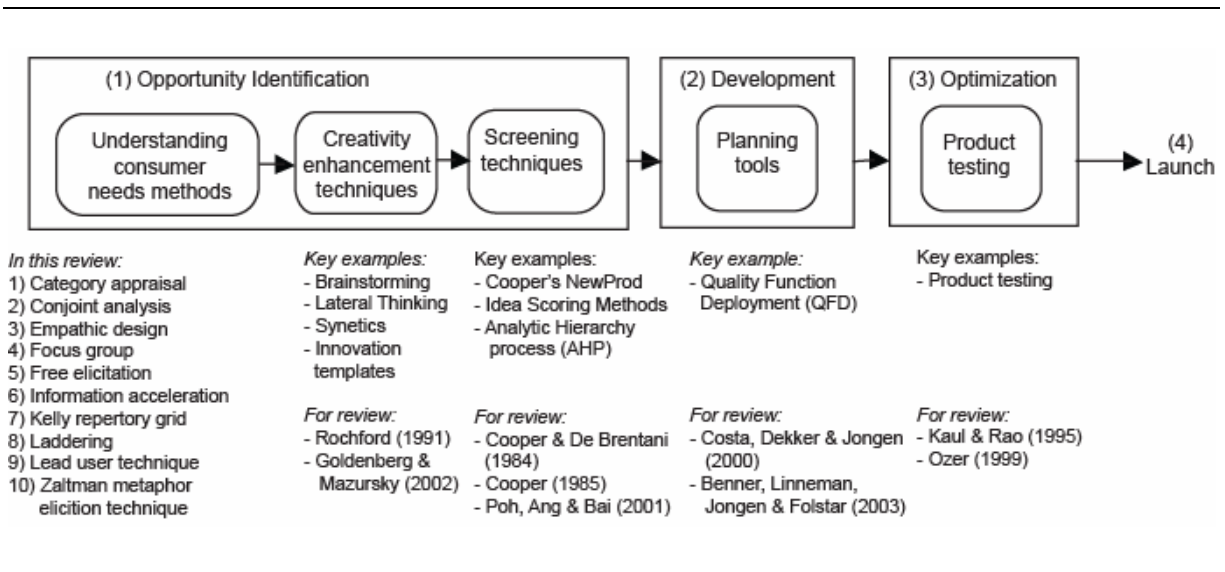
## 2.1 Introduction

New product development (NPD) can originate from new technology or new market opportunities (Eliashberg, Lilien and Rao, 1997). But irrespective of where opportunities originate, when it comes to successful new products it is the consumer who is the ultimate judge (Cooper and Kleinschmidt, 1987; Brown and Eisenhardt, 1995). So, in order to develop successful new products, companies should gain a deep understanding of 'the voice of the consumer'. Consumer research can be carried out during each of the basic stages of the NPD process: (1) opportunity identification, (2) development, (3) testing, and (4) launch (Urban and Hauser, 1993; Suh, 1990). It is most widely applied during the development, testing and launch stages. Even the most technologically oriented companies use consumer research to verify that consumers will accept a new product when it will be launched at the market. Despite the importance of the later stages, it is increasingly recognised that successful NPD strongly depends on the quality of the opportunity identification stage (Cooper, 1988; 1998; McGuinness and Conway, 1989). The goal of this stage is to search for new areas of opportunities, which typically involve the unmet needs and wants of consumers.

Consumer research is often considered difficult during this stage because it is unsure what to ask consumers at this point. An often-heard argument is that asking consumers what they want is useless, because they do not know what they want (Ulwick, 2002). Consumer research, however, helps to raise the odds of success in the market. Even though consumers may not always be able to express their wants, it is important to understand how they perceive products, how their needs are shaped and influenced and how they make product choices based on them. In this way, it helps to avoid working on a new product that has a low probability of success in the first instance (Rochford, 1991). Additionally, it guards against potential winning product concepts being overlooked. As a result, carrying out consumer research in this stage is inexpensive compared to the risk of product failure. Moreover, gathering consumer understanding with the help of formal consumer research methods has the advantage that the results can more easily be disseminated across departments in an organisation (Kohli and Jaworski, 1990). Knowledge obtained through formal methods is generally used to a greater extent, most likely through its verifiability and credibility (Maltz and Kohli, 1996).

Figure 2.1 shows the four typical major stages in NPD along with representative consumer research methods. Since this review is focusing on the opportunity identification stage, only examples of methods are being listed under the other phases. Unfortunately, despite the large number of available methods and techniques to be used in the NPD process, the majority of them are not used by companies or mostly applied in an ad-hoc manner (Mahajan and Wind, 1992; Nijssen and Lieshout, 1995; Nijssen and Frambach, 2000). Large parts of the conducted research in NPD consist of focus groups, surveys and the study of demographic data. This is considered to be one of the reasons for the relatively low new product success rates (Wind and Mahajan, 1997).

**Figure 2.1: Overview of stages of new product development process along with representative consumer research methods and key references for reviews**



The failure of methods to reach their full potential in NPD is perhaps the result of the limited and confused way in which they have been evaluated and made clear to potential users. In contrast to the significant attention paid to methods like Quality Function Deployment (QFD) and product testing methods, analysis of strengths and weaknesses of consumer research methods for opportunity identification has received only little attention. For example, there have already been several excellent review articles in the area of creativity enhancement (e.g. Goldenberg and Mazursky, 2002), concept screening (e.g. Cooper and De Brentani, 1984; Poh, Ang and Bai, 2001), development planning tools like QFD (e.g. Costa, Dekker and Jongen, 2001; Benner et al., 2003), and product testing methodology (e.g. Ozer, 1999). In contrast, most research in the area of opportunity identification has presented the procedures and theoretical foundation of a single method and little has been done to assess methods in terms of their appropriateness. Therefore, the objective of this paper is to critically review ten of the most common consumer research methods and techniques<sup>2</sup>. The following ten methods and techniques are evaluated: (1) empathic design, (2) category appraisal (including preference analysis), (3) conjoint analysis, (4) focus group, (5) free elicitation, (6) Information Acceleration (IA), (7) kelly repertory grid, (8) laddering, (9) lead user technique, and (10) zaltman metaphor elicitation technique (ZMET). We choose them as representative of what is currently available for product development purposes.

<sup>2</sup> Although the difference between a method and a technique cannot be specified straightforwardly, in line with Roozenburg and Eekels (1995), we consider a method as a class of specific operating procedures, while a technique refers more to a single procedure or heuristic. Accordingly, creativity enhancement approaches are often called techniques, whereas surveys and experiments are called methods.

Their objective is to provide diagnostic consumer information relevant to the perception, preference and value satisfaction resulting from the consumption of products. Although they have the same overall objective, they differ in many respects: not only in the procedure they follow, but also in the resulting consumer needs. Fundamental differences in these methods may lead to different 'optimal' solutions to consumers' unmet needs. The choice for using a particular method or technique in the predevelopment stages is therefore not arbitrary. In particular, the appropriateness depends on the purpose for which they are implemented (support marketing versus support R&D) and the innovation strategy, which is pursued (winning in existing well-defined markets versus building a new market through radically new products). In line with this, we see three major issues in literature (e.g. Eliashberg, Lilien and Rao, 1997) which determines the choice for a particular method or technique: (1) information source for need elicitation, (2) task format, and (3) need actionability. Hence, the purpose of this paper is threefold:

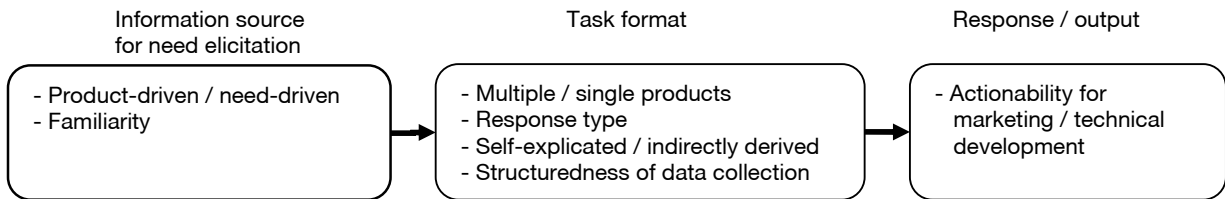
1. Develop a categorisation scheme against which similarities and differences between methods can be made more apparent
2. Describe methods in their key features
3. Provide guidelines for the appropriate method given strategic product development objectives of companies.

We organise this review as follows. First, we outline the categorisation scheme on which the methods will be described (section 2.2). Next, each method will be described along the basis performance dimensions in section 2.3. Finally, we review how each method can be used under alternative product development strategies in section 2.4. A glossary of frequently used terminology can be found in the appendix.

## **2.2 Categorisation scheme**

Based on consumer psychology and marketing literature, we develop a categorisation scheme (figure 2.2) in which methods are grouped according to the most significant determinants of results. The output of a particular method depends on the considered information source for need elicitation (i.e. the input) and the task format (e.g. Simonson, 1993). The basic type (product- versus need-driven) and familiarity of the stimuli determines how participants are going to react and process information in order to respond to questions asked. The identification of consumer needs can proceed in various ways. It is generally assumed that when consumers respond to questions, their answers represent the true meaning. However, depending on the task to be performed in a method, consumers pay attention to different kinds of aspects. The impact of task format is discussed. Finally, we discuss how output of methods differs with respect to their abstractness and how this impacts their actionability for subsequent tasks in NPD.

**Figure 2.2: Categorisation scheme of methods in this review**



### ***Information source for need elicitation***

In consumer research, stimuli are used to guide participants in revealing their opinion. An important distinction can be made between the type of stimulus that is used to elicit consumer needs, which can be need- or product driven, and the familiarity of the stimulus.

#### *Product- versus need-driven methods*

The core of the marketing concept is that underlying needs motivate consumer purchase behaviour. Accordingly, the central goal in NPD is to create a product with superior consumer value so that consumer needs will be satisfied (Slater and Narver, 2000). But what exactly are consumer needs? In this respect, it is important to distinguish needs and wants. Needs are more general as they refer to basic human requirements like food, air, water, and clothing. Wants are much more specific and related to concrete objects that might satisfy the need. A consumer needs food, but wants a hamburger, apple or sandwich (Antonides and Van Raay, 1998; Kotler, 2003). Needs can originate from either an internal or external source. First, an internal perceived state of discomfort of the consumer, for example feeling hungry or bored, may arouse needs. Also external information may lead consumers to realise that they have a need. For example, an advertisement of multivitamins or the sight of the bakery with the smell of fresh-baked bread can all serve as external stimuli that arouse the recognition of a need (Bruner and Pomazal, 1988; Sheth, Mittal and Newman, 1999). Similarly, we characterise methods that attempt to unlock consumers' needs as either 'need-driven' or 'product-driven'. In need-driven methods, participants are asked to reveal their internal needs, without being exposed to (pictures) of products. Consumers' problems and needs are the source of information in these kinds of methods. In contrast, product-driven methods confront consumers with products as cues to start the identification of needs and wants. Looking at or tasting from these products arouses the recognition of the need or problem. In other words, exposure to products is the driving force in product-driven methods and (unfulfilled) needs are derived from them.

Product-driven methods provide a restricted view on consumer needs. They provide insights that are limited by the particular product(s) included in the study- that is, they elicit consumer needs within an existing framework of what is already available on the market. On

the other hand, reactions to existing products are relatively predictable, and results can easily be translated in corresponding product requirements. A disadvantage, however, of starting too early in the NPD process with concrete products is that it may kill creativity and thinking 'out of the box'. In particular, it will easily lead to fixation on existing products. In contrast, understanding consumer problems or motivations rather than the product itself keeps all possible solutions open for consideration and avoids prematurely limiting possibilities (Patnaik and Becker, 1999). It is assumed that the more unstructured and ambiguous a stimulus, which often is the case in need-driven methods, the more consumers will reveal their true emotions, motives and values about a topic. Nevertheless, building mostly upon abstract consumer needs, it is hard for product developers to move to a concrete concept that incorporates these consumers' needs.

### *Familiarity*

The result of a particular method depends to a large extent on the *familiarity* of provided stimuli. It is generally known that evaluation tasks become more difficult when stimuli are more complex or unfamiliar. Familiarity in evaluating products is defined as the number of product-related experiences that have been accumulated by the consumer (Alba and Hutchinson, 1987). The more familiar the product, the more specific consumer needs can be inquired after. Because concrete attributes often can be assessed in the choice situation, information about abstract attributes is usually retrieved from memory (Hastie and Park, 1986). Hence, when participants are more familiar with a product, the quantity of accessible information in memory is higher. Moreover, since especially abstract attributes are stored in memory, the amount of information that is retrieved from memory on these abstract attributes is predicted to be higher. In contrast, consumers have often difficulties in evaluating major innovations. In particular, it can be unclear for consumers to understand what needs the new products could satisfy. The difficulty of evaluation of such products depends on the type of information and knowledge that consumers have about the particular attributes of a product. In case a consumer has minimal experience with the product, it is difficult to retrieve the relevant attributes to evaluate the product. Due to limited cognitive capacities of the human mind, people often make heuristic decisions when encountered with complex stimuli. As a consequence, decisions are made by a rule of thumb, and not all information is taken into account. As a result, consumers' opinion about new products may not have a high predictive validity. Although this can partly be prevented by including consumers with moderate to high levels of product expertise (Schoormans, Ortt and De Bont, 1995), consumers may change their opinion by the time the product will be introduced.



### ***Task format of method/technique***

Task differences in methods can be responsible for differences in elicited consumer needs. Research suggests that preferences are partly constructed for a specific choice task (Simonson, 1993; Steenkamp and Van Trijp, 1997). The impact of task format threatens the validity of the conclusions drawn from the application of the method.

#### *Evaluating multiple products versus a single product*

The identification of consumer needs is systematically affected by whether participants make direct comparisons between multiple products or whether they evaluate products one at a time. Most theories of consumer behaviour assume that the consumer's choice among alternative products is based on a comparison of products in a choice set. So, methods that include a set of competing alternatives available in the market have the advantage that they represent the task that consumers typically perform in the market. However, when consumers compare very different kind of products, they compare them at higher levels of comparison (Johnson, 1984, 1988). For example, in this way a consumer is able to compare two dissimilar alternatives (such as a video cassette recorder and tickets to the ballet) on abstract values (such as potential for fun and enjoyment) (Corfman, 1991). In tasks where products that have to be compared are more similar, concrete and 'comparable' attributes like price tend to be more important (Malhotra, Peterson and Kleiser, 1999). In contrast, when individual products are evaluated, the importance of attributes (e.g. creaminess) is influenced by the ease of evaluating each attribute by itself (Nowlis and Simonson, 1997). The reason for this is that consumers do not have well-articulated preferences for the specific level (e.g. two or three euro) each attribute can have.

#### *Response type*

Methods for consumer input can be categorised in terms of the response type required of participants. The first category is *association*. In an association task, participants are presented with a stimulus and asked to indicate the first word, image or thought elicited by that stimulus. Associative theory claims that these words, images or thoughts are joined to each other in such a way that one tends to evoke the other (Malaga, 2000). A further distinction can be made between inquiring after *preference* or *perceptual judgements*. Market researchers often assume that preference and perceptual judgements are closely linked. The rationale for this is that if two products are perceived as very similar, they are similarly preferred. However, previous research found that this is not the case (Creusen and Schoormans, 1997). Two products can be totally different in terms of for example appearance and taste and still equally liked. Similarity questions will identify perceptual differences between products resulting from participants' comparison process. These comparison processes typically evoke visual salient and distinctive attributes (Lefkoff-Hagius and Mason, 1993). This is useful information for technical product development as in the development stage, information is required about how

the product should look. In contrast, asking a consumer after his or her preferences evokes a different thinking process, resulting in other aspects of the product considered important. Before giving a preference judgement, consumers will imagine the benefits the product will deliver for them. This information is very important for NPD, as consumer needs arising from preference judgements have a higher predictive validity for purchase than consumer needs arising from perceptual judgements.

#### *Self-articulated or indirectly derived consumer needs*

The output of methods will also be influenced by the task used to derive consumer needs. Hence, a fundamental distinction can be made between methods involving consumers' *self-articulated* needs (directly derived) and those that derive needs *indirectly* (e.g. statistically or by means of observation). In direct approaches, the participant is asked and often guided to give reasons for liking, preference or choice. A number of relevant issues arise in this respect.

*First*, letting consumers articulate their needs themselves implies that you assume that consumers are able to fully understand their own needs and are able to express them. Research on decision-making, however, has revealed that consumers are frequently unaware of their underlying choice criteria and aspirations in purchasing a product or choosing one product instead of another (Simonson, 1993; Steenkamp and Van Trijp, 1997). People do not have clear and stable preferences, even when they have complete information about the characteristics of alternatives. To a large extent, consumers construct their preferences when faced with a specific purchase decision, rather than retrieve pre-formed evaluations. Moreover, consumers may have needs that they are not aware of, often referred to as 'latent needs'. Consumers do not ask for the fulfilment of these needs and may not have the ability to articulate them. This is because products, which could fulfil them probably, do not yet exist. Identifying and understanding such 'latent needs' is of crucial importance, since these needs, if they were fulfilled, would delight and surprise the consumer (Griffin and Hauser, 1993). Moreover, novel solutions to people's latent needs can differentiate a product from its competitors and make consumers more loyal (Oliver, Rust and Varki, 1997). *Second*, by directly deriving consumer needs, it is implicitly assumed that consumers are able to express their needs and wants correctly during personal and group interviews. However, research has shown that thinking and elaborating about products or issues leads to more extreme beliefs, preferences or predictions (Alba and Hutchison, 2000). One prominent stream of research has examined the effects of instructions to engage in imagination and explanation of a hypothetical outcome prior to judgement. In his review about experiments that require people to generate explanations or imagine scenarios, Koehler (1991) found that explanation tasks affect people's subsequent judgement about an issue. In particular, when consumers must make forecasts regarding future purchase and usage conditions; this requires substantial thinking and considering of options. As a result, people become convinced of the reasons they produce and this leads to more extreme beliefs, preferences, and hence less valid predictions about future market behaviour. *Third*, another assumption made when deriving consumer needs directly is that participants are prepared to tell them to the researcher. However, in a typical interview, consumers do not share their innermost feelings with a researcher- who is after all a stranger.

Moreover, they may fear being considered irrational and may therefore be reluctant to admit certain types of (purchasing) motives (Donoghue, 2000).

Instead of questioning consumers directly, they may be asked to respond indirectly. In indirect approaches, participants are not asked directly why they prefer a product or which attributes determine their choice. Consumer needs are inferred from subjects' response to other variables (like liking, preference) or by interpretation of behaviour by the researcher (observation). For example, in decompositional conjoint analysis, importances are derived from regression of overall product evaluations on perceptions of product's attributes levels. Other examples of indirect approaches include statistical techniques such as multiple regression analysis and multidimensional scaling techniques.

### *Structure of data collection*

The way data is collected in consumer studies varies substantially in its level of structuredness. Structure is the degree of standardization imposed on the data collection instrument (Churchill, 1995). In highly *structured* data collection, the questions to be asked and the responses permitted are completely predetermined. An advantage of the structured task is that the obtained responses are directly in quantitative terms and require no further subjective interpretation on the part of the researcher. This in turn offers advantages like more speed in data analysis, lower costs and more convenience for respondents. However, the researcher must have a good feel for the range and types of responses so that meaningful and valid response categories can be constructed (Parasuraman, 1991). In a highly *unstructured* questionnaire or interview, the questions to be asked are not necessarily presented in exactly the same wording to every participant and participants are free to respond in their own words. The advantages are that in-depth and detailed responses can be queried for, which may provide the researcher with new insights and ideas for the NPD process. A shortcoming of this kind of research is that the in-depth and idiosyncratic information obtained does not lend itself for direct use in subsequent analysis. A categorization and quantification step is required on the basis of subjective interpretation on the part of the researcher. As such, the personal view of the researcher may affect the way the data are interpreted and a researcher bias can occur as a result from selective observation and recording of information.

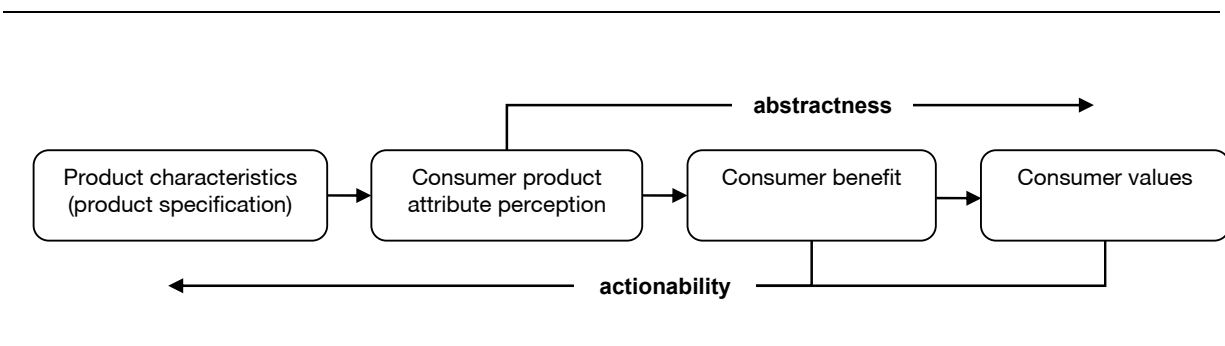
### **Actionability of output**

Applying methods does not necessarily lead to the actual use of their results. Information will be used if it is perceived to be relevant for the task for which the receiver is responsible (Moenaert and Souder, 1996; Madhavan and Grover, 1998). Consumer research during the opportunity identification phase should provide (1) understanding what drives consumers' decision processes and which factors influence these processes as foundation for the generation and screening of new product ideas, and (2) concrete input for subsequent technical development stage (Rochford, 1991; Mascitelli, 2000). For that reason, it is relevant to evaluate methods on their actionability in providing critical input to both technical and

marketing-related tasks in NPD. Actionability refers to the ability of information to indicate specific actions to be taken in order to achieve the desired objective (Shocker and Srinivasan, 1979).

In assessing the actionability of elicited consumer needs, we distinguish a hierarchy of concrete product characteristics that form the basis of the technical product specification to abstract consumer values (figure 2.3). *Product characteristics*<sup>3</sup> are measurable, manipulable and physical properties of products under control of technical product developers (Myers and Shocker, 1981; Shocker and Srinivasan, 1979). These characteristics are also referred to as 'tangible'. *Product attributes* are those characteristics (either intrinsic or extrinsic) that the consumer infers from the product, like the creaminess. Furthermore, consumers desire products not for their attributes per se, but rather for the *benefits* they deliver. The key characteristic of these benefits is that they reflect what the product does for the consumer. Benefits are pleasant consequences of consuming a product. Different products can deliver the same benefit, which implies that benefits are not product specific. Benefits differ from attributes in that people receive benefits whereas products have attributes (Myers and Shocker, 1981; Gutman, 1982). Examples of benefits include 'health', 'good taste' and 'convenience'. Finally, values represent important beliefs about oneself and the perception of oneself by others. They are either 'instrumental' (preferred modes of conduct such as honesty and courage) or 'terminal' (preferred end-states of being such as freedom and living an exciting life) (Rockeach, 1973).

**Figure 2.3: Actionability and abstractness of provided information**



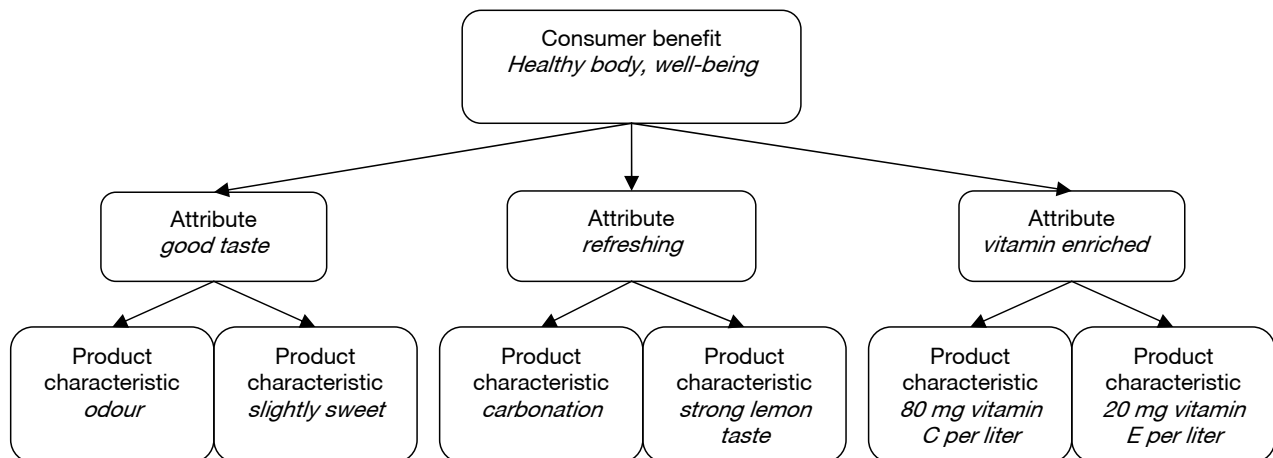
Technical product developers have the task of merging knowledge of what consumers want with knowledge of what is (technologically) possible. The more abstract consumer needs are elicited, the less actionable a method is for technical product development (figure 2.3). Product developers need to know how abstract benefits (e.g. enhancing my health condition) translate into specific, concrete characteristics sought from desirable alternatives (e.g. the specific health promoting ingredients in a food). Methods that indicate which product attributes and characteristics consumers use to infer the presence of desired consequences permits clearer

<sup>3</sup> The term 'characteristic' is often used simultaneously with 'feature'. A feature, however, can be considered a dichotomous characteristic, while a characteristic has continuous dimensions (Garner, 1978).

specifications for product development. Important to note is that the relationship between consumer benefits and product characteristics is not unique: the number of product characteristics is far greater than the number of attributes and benefits. Multiple product characteristics can satisfy a product attribute and multiple attribute combinations can provide the consumer one particular benefit. Figure 2.4 represents this so-called 'reverse mapping problem', which indicates the lack of one-to-one translation possibility in NPD (Kaul and Rao, 1995).

Marketing-oriented tasks involve the creative phase of finding new product ideas. When consumer needs are linked too early to product characteristics, it may kill the creativity in finding really new product ideas. The more abstract consumer needs are, the more freedom in creativity is left. Information about which benefits consumers are seeking in a particular product enlarges the solution space and prevents thinking within the box of current product delivery. In this way, it can serve as a source of inspiration. Inspiration refers to becoming motivated because of new insights and possibilities being revealed that individuals would not have recognised on their own (Thrash and Elliot, 2003). Additionally, it may create a shared understanding and team spirit in the development group (Slater and Narver, 2000).

**Figure 2.4: Reverse mapping problem (e.g. Kaul and Rao, 1995): Multiple product characteristics and attribute combinations can deliver against one consumer benefit**



### **2.3 Review of methods and techniques**

Table 2.1 presents a condensed description of each method including its underlying theoretical basis and operating procedure. Additionally, table 2.1 provides key references of papers of the creator(s), or researchers who were among the first to introduce a method in marketing research or NPD. Furthermore, we include references of papers that applied a method or technique in a NPD context. This section reviews the ten methods and techniques according to the categorisation scheme presented in the previous section 2.2. Table 2.2 summarises this review by indicating how each method scores on each of the performance dimensions.

**Table 2.1: Theoretical basis, operating procedure and key references of 10 consumer research methods and techniques for opportunity identification in new product development (in alphabetic order)**

<i>Method</i>	<i>Theoretical basis</i>	<i>Operating procedure</i>	<i>Key references</i>
<b>Category appraisal</b>	No specific	<ol style="list-style-type: none"> <li>The researcher selects a set of competing products of interest (possibly including a product concept).</li> <li>The products are presented to the respondent.</li> <li>The respondent directly ranks, rates or sorts the products on sensory, preference or perceptual attributes or on their perceived (dis)similarity.</li> <li>One of the widely available statistical procedures (e.g. factor analysis, multidimensional scaling) is used to graphically portray stimuli, respondent's individual preferences and/or attributes in a geometrical space.</li> <li>The resulting map captures many significant factors defining the competitive structure of the product category. Depending on the applied technique, the map: <ul style="list-style-type: none"> <li>shows intensity of competition between products – the closer two product are together, the more similar they are perceived or preferred</li> <li>summarizes how consumers perceive products on each attribute</li> <li>shows relationships between attributes and how well these attributes differentiate between products</li> <li>indicates areas of the map which are desirable to certain segments of consumers.</li> </ul> </li> </ol>	<p>Internal preference analysis</p> <ul style="list-style-type: none"> <li>Coombs, 1964</li> <li>Tucker, 1960</li> </ul> <p>External preference analysis</p> <ul style="list-style-type: none"> <li>Carroll, 1972</li> <li>Green and Carmone, 1969</li> <li>Greenhoff and MacFie, 1994</li> <li>Moskowitz, 1985; 1994</li> </ul> <p>NPD applications</p> <ul style="list-style-type: none"> <li>Richardson-Harman et al., 2000</li> <li>Guinard, Uotani and Schlich, 2001</li> </ul>
<b>Conjoint analysis</b>	Experimental design	<ol style="list-style-type: none"> <li>The researcher selects attributes relevant to the product category (e.g. by means of a focus group with target consumers).</li> <li>The researcher selects the levels of each attribute to be used in study. Typically studies use between two and five levels for each attribute. Hypothetical products are defined as combinations of attribute levels.</li> <li>The respondent is given a set of these hypothetical profiles (constructed along factorial design principles in the full profile case).</li> <li>The respondent ranks or rates the stimuli according to some overall criterion, such as preference, acceptability, or likelihood of purchase.</li> <li>In the analysis of the data, part-worths are identified for the attribute levels such that each specific combination of part-worths equals the total utility of any given profile. A set of part-worths are derived for each respondent.</li> </ol>	<ul style="list-style-type: none"> <li>Green and Srinivasan, 1978</li> <li>Green, Krieger and Wind, 2001</li> </ul> <p>NPD applications</p> <ul style="list-style-type: none"> <li>Frewer, Howard, Hedderley and Shepherd, 1997</li> <li>Lilien and Rangaswamy, 1998</li> <li>Krieger, Cappuccio, Katz and Moskowitz, 2003</li> </ul>

**Table 2.1 (continued): Theoretical basis, operating procedure and key references of 10 consumer research methods and techniques for opportunity identification in new product development**

<i>Method</i>	<i>Theoretical basis</i>	<i>Operating procedure</i>	<i>Key references</i>
<b>Empathic design</b>	Theories of anthropological investigation and tacit knowledge	<ol style="list-style-type: none"> <li>1. A multi-functional team is created to observe the actual behavior and environment of consumers. The goal is to see what consumers do and don't do, how to make their tasks easier or more pleasant, and see those needs that consumers don't expect can be met. It is decided who should be observed, who should do the observation (e.g. an expert in a certain discipline) and what the observer should be watching (e.g. normal routines of people).</li> <li>2. A visual record is made of consumers interacting with their environment. Photographs, videotape, sketches and notes are tools, which make a record of behavior. Data can as well be gathered through responses to questions like 'why are you doing that?'</li> <li>3. Team members have a brainstorming session to transform observations into graphic, visual representations of possible solutions. At this step, the team should include some individuals who were not on the original team of observers.</li> <li>4. A non-functional, two or three-dimensional model of a product concept provides a vehicle for further testing among potential consumers.</li> </ol>	<ul style="list-style-type: none"> <li>▪ Polanyi, 1966</li> <li>▪ Leonard, 1995</li> <li>▪ Leonard and Sensiper, 1998</li> </ul> <p>NPD applications</p> <ul style="list-style-type: none"> <li>▪ Leonard and Rayport, 1997</li> <li>▪ Ulwick, 2002</li> </ul>
<b>Focus group</b>	No specific	<ol style="list-style-type: none"> <li>1. A group of participants, usually eight to ten, sits together for a more or less open-ended discussion about a product or a specific topic.</li> <li>2. The discussion moderator let participants introduce themselves and feel comfortable and makes sure that the topics of significance are brought up. To help participants verbalise their needs, interaction between group members is encouraged.</li> <li>3. The report summarises what was said, and perhaps draws inferences from what was said and left unsaid in the discussion.</li> </ol>	<ul style="list-style-type: none"> <li>▪ Calder, 1977</li> <li>▪ McQuarrie and McIntyre, 1986</li> <li>▪ Bruseberg and McDonagh-Philp, 2002</li> </ul> <p>NPD applications</p> <ul style="list-style-type: none"> <li>▪ McNeill, Sanders and Civile, 2000</li> </ul>



**Table 2.1 (continued): Theoretical basis, operating procedure and key references of 10 consumer research methods and techniques for opportunity Identification in new product development**

<i>Method</i>	<i>Theoretical basis</i>	<i>Operating procedure</i>	<i>Key references</i>
<b>Free elicitation</b>	Theories of spreading activation	<ol style="list-style-type: none"> <li>1. The researcher presents stimulus probes or cues (usually words) to the participant</li> <li>2. The participant is asked to rapidly verbalise the concepts that come to mind and that he/she considers relevant in the perception of the stimulus. For example, when the stimulus is a product name, the objective is to activate all nodes associated with this product name in respondent's memory. It is assumed that first mentioned statements are most important.</li> <li>3. The interview is generally recorded and transcribed before analysis.</li> <li>4. Results can be analyzed in a variety of ways, depending on the goal of the research, for example by displaying associative knowledge networks or classifying statements in meaningful categories.</li> </ol>	<ul style="list-style-type: none"> <li>▪ Collins and Loftus, 1975</li> <li>▪ Anderson, 1983</li> </ul>
<b>Information acceleration</b>	Diffusion of innovations and decision-flow models	<ol style="list-style-type: none"> <li>1. The researcher constructs a virtual buying environment that simulates the information that is available to consumers at the time that they make a purchase decision.</li> <li>2. Respondents are 'accelerated' into the future by providing them alternative future environments that are favourable, neutral, or unfavourable towards the new product. In this virtual buying environment, they are allowed to search for information or shop.</li> <li>3. Measures are taken of respondents' likelihood of purchase, perceptions, and preferences.</li> <li>4. Based on these measures, a model is developed to forecast sales and simulate strategy alternatives.</li> </ol>	<ul style="list-style-type: none"> <li>▪ Urban, Weinberg and Hauser, 1996</li> <li>▪ Urban, Hauser, Qualls, Weinberg, Bohlmann and Chicos, 1997</li> </ul>
<b>Kelly repertory grid</b>	Personal construct theory	<ol style="list-style-type: none"> <li>1. The participant is provided with a set of products presented in groups of three products.</li> <li>2. For each triple combination, the participant is asked to think carefully about the products, and decide in what way two of them are similar, and at the same time, different from the third one.</li> <li>3. Having identified the reasons to discriminate between the products, the participant is then asked what they would consider the opposite to be. This procedure is repeated until all products are evaluated in combinations of three.</li> <li>4. The attributes (called constructs) are all written down on a grid sheet. A repertory grid is a matrix representation of products and constructs. In addition, all products can be scored against each construct to find out its importance.</li> <li>5. Grids can be clustered by content analysis, frequency counts, or principal component analysis to analyse what is relevant, similar and different in the eyes of the consumer.</li> </ol>	<ul style="list-style-type: none"> <li>▪ Kelly, 1955</li> <li>▪ Sampson, 1972</li> </ul> <p>NPD applications</p> <ul style="list-style-type: none"> <li>▪ Thomson and McEwan, 1988</li> <li>▪ Bech-Larsen and Nielsen, 1999</li> </ul>

**Table 2.1 (continued): Theoretical basis, operating procedure and key references of 10 consumer research methods and techniques for opportunity identification in new product development**

<i>Method</i>	<i>Theoretical basis</i>	<i>Operating procedure</i>	<i>Key references</i>
<b>Laddering</b>	Means-end chain theory	<ol style="list-style-type: none"> <li>The participant is provided with a set of products.</li> <li>The participant is asked to make distinctions between the products (by means of triadic sorting on perceived meaningful differences or by means of preference differences or by means of perceived differences by occasion).</li> <li>Each mentioned distinction is the starting point for a series of 'why'-probes by the researcher, to determine sets of linkages between attributes, consequences and values.</li> <li>Once all interviews are completed, key elements of the interview are summarised by standard content-analysis, taking into account the different levels of abstraction.</li> <li>A summary table is constructed representing the number of connections between elements.</li> <li>From the summary table dominant connections are graphically represented in a tree diagram, called a hierarchical value map (HVM). Hierarchical value maps consist of a number of ladders (or association networks), and represent the combinations of attributes, benefits, and values that consumers use as a basis for distinguishing between products in a given product class.</li> </ol>	<ul style="list-style-type: none"> <li>Gutman, 1982</li> <li>Reynolds and Gutman, 1988</li> </ul> <p>NPD applications</p> <ul style="list-style-type: none"> <li>Walker and Olson, 1991</li> <li>Claeys, Swinnen and Van den Abeele, 1995</li> <li>Nielsen, Bech-Larsen and Grunert, 1998</li> </ul>
<b>Lead user technique</b>	Diffusion of innovations	<ol style="list-style-type: none"> <li>To identify lead users in a product category of interest, the researcher first identifies underlying trends on which these lead users will have a leading position (e.g. by means of expert method 'Delphi', trend extrapolation techniques or econometric models).</li> <li>Lead user indicators are specified by: (1) finding a market or technological trend and related measures, and (2) defining measures of potential benefit (e.g. user dissatisfaction with current products, evidence of active modification of product by user themselves).</li> <li>The potential market is screened based on measures specified in previous step (e.g. by means of a questionnaire) to identify a lead user group.</li> <li>Data from lead users is derived concerning their experience with novel product attributes and product concepts. Creative group sessions are often used to pool user solution content and develop new product concepts. In some cases, a fully implemented product is developed in co-operation with the lead users.</li> <li>The products developed by lead users are evaluated by more typical users in target market by conducting traditional product tests after segmenting lead and non-lead users.</li> </ol>	<ul style="list-style-type: none"> <li>Von Hippel, 1986, 1988</li> <li>Urban and Von Hippel, 1988</li> </ul> <p>NPD applications</p> <ul style="list-style-type: none"> <li>Herstatt and Von Hippel, 1992</li> <li>Von Hippel, Thomke and Sonnack, 1999</li> <li>Olson and Bakke, 2001</li> <li>Lilien, Morrison, Searls, Sonnack and Von Hippel, 2002</li> <li>Von Hippel and Katz, 2002</li> </ul>

**Table 2.1 (continued): Theoretical basis, operating procedure and key references of 10 consumer research methods and techniques for opportunity identification in new product development**

<i>Method</i>	<i>Theoretical basis</i>	<i>Operating procedure</i>	<i>Key references</i>
<b>Zaltman metaphor elicitation technique (ZMET)</b>	Theories of non-verbal communication, metaphors as representations of thoughts, mental models	<ol style="list-style-type: none"> <li>1. Participants are given instructions about research topic (e.g. a brand name, a corporate identity, a product design) and the task to take photographs and/or collect pictures (e.g. from magazines/books) that indicate what the topic means for them. Seven to ten days later a personal interview is planned.</li> <li>2. Participants bring in their pictures and photographs and tell their stories about the topic (storytelling).</li> <li>3. Participants are asked to make distinctions between products (e.g. by means of triadic sorting). Each mentioned distinction is starting point for a series of 'why'-probes by the researcher, to determine sets of linkages between attributes, consequences and values (laddering technique).</li> <li>4. Participants are asked to indicate picture that (1) most represents their feelings, and (2) might describe the opposite of the task that they were given. In addition, they are asked to use other senses to convey what does and does not represent the topic being explored.</li> <li>5. The interviewer reviews all the constructs discussed and participant creates a map to illustrate connections among important constructs (mental map).</li> <li>6. Next, a summary image or montage is constructed by participant or a graphic technician to express important issues (e.g. by digital imaging techniques).</li> <li>7. A consensus map is created by analyzing number of constructs and frequency of related constructs. The consensus map is a diagram showing linkages among constructs. Constructs are related to each, in that some constructs are originating points in a reasoning process and others are ending points. Connectors constructs serve as linkages between constructs. In addition, an interactive CD can be composed which includes the visual, sensory and digital images and vocal descriptions along with vignettes to illustrate how consumers experience constructs.</li> </ol>	<ul style="list-style-type: none"> <li>▪ Zaltman and Coulter, 1995</li> <li>▪ Zaltman, 1997</li> </ul> <p>NPD applications</p> <ul style="list-style-type: none"> <li>▪ Coulter, Zaltman and Coulter, 2001</li> <li>▪ Christensen and Olson, 2002</li> </ul>

**Table 2.2: Ten methods described on stimuli, task format, and actionability**

<i>Methods</i>	<b>Stimuli</b>			<b>Task format</b>			<b>Actionability</b>
	<i>Product / need-driven</i>	<i>familiarity</i>	<i>Multiple or single product(s)</i>	<i>Response type</i>	<i>Self-articulated/ indirectly derived</i>	<i>Structure of data collection</i>	<i>Abstractness</i>
<b>Category appraisal</b>	product-driven	familiar	multiple products	perceptions / preference	indirectly derived	structured	characteristics and benefits
<b>Conjoint analysis</b>	product-driven	unfamiliar	multiple products	preference	indirectly derived	structured	characteristics and benefits
<b>Empathic design</b>	need-driven	no stimuli presented	no product evaluation: observation	no judgements asked <sup>a</sup>	indirectly derived	unstructured	benefits
<b>Focus group</b>	product- or need-driven	familiar/ unfamiliar	multiple / single product(s)	preference	self-articulated	unstructured	characteristics and benefits
<b>Free elicitation</b>	product-driven	familiar	single product	association	self-articulated	unstructured	characteristics and benefits
<b>Information acceleration</b>	product-driven	unfamiliar	multiple products	perceptions / preference	self-articulated	structured	characteristics and benefits
<b>Kelly repertory grid</b>	product-driven	familiar	multiple products	perceptions	self-articulated	unstructured	characteristics
<b>Laddering</b>	product-driven	familiar/ unfamiliar	multiple products	perceptions / preference	self-articulated	unstructured	characteristics, benefits, and values
<b>Lead user technique</b>	need-driven <sup>b</sup>	familiar <sup>c</sup>	multiple / single product(s)	no perceptions / preference, but solutions	self-articulated	unstructured	characteristics and benefits <sup>d</sup>
<b>Zaltman metaphor elicitation technique</b>	need-driven	unfamiliar	no product evaluation	association	self-articulated	unstructured	benefits and values

<sup>a</sup> *Empathic design emphasizes observation over inquiry. However, observers may ask very open-ended questions, such as 'why are you doing that?'*

<sup>b</sup> *Product-driven in case lead user developed own solution to needs*

<sup>c</sup> *Familiar from lead user's viewpoint, although new concepts are primarily unfamiliar from ordinary consumer's viewpoint*

<sup>d</sup> *As focus is on solutions to needs, the elicited needs will be characteristics and benefits*

## ***Category appraisal***

Category appraisal refers to a set of procedures to obtain a visual representation of positions that products hold in the consumers' mind. It shows the structure of markets as perceived or preferred by consumers, for example the red pasta sauce category, and as such they enable product developers to discover product opportunities and to identify attributes which drive product choice. Category appraisal includes internal preference analysis, external preference analysis and Moskowitz' category appraisal.

### *Information source for need elicitation*

Category appraisal is *product-driven*, as they basically involve a consumer evaluation of a set of competitive products. Their primary aim is to develop an understanding how consumers perceive and prefer products by depicting the competitive structure of product category in a certain market. The stimulus set consists primarily of products available on the market, and hence they are typically *familiar* to participants. It is possible to include new product concepts, which are not yet familiar to respondents. In that case, it is generally recommended to first make respondents familiar with the concept by explaining it sufficiently (Urban and Hauser, 1993).

### *Task format of category appraisal*

Respondents typically fill in a questionnaire in which they rank or rate *multiple products* on their perceived (dis)similarity, (sensory) attributes and/or on preference. As such, the data collection is highly *structured* and directly in quantitative terms. External preference analysis and Moskowitz' category appraisal build on perceptual judgements, as the product map is derived from respondents' (dis)similarity or (sensory) attribute ratings. Consumers' preference ratings can be fitted into the map at a later stage. Internal preference analysis, in contrast, gives priority to consumer preferences and uses perceptual information as a complementary source of information. Category appraisal derives consumer needs *indirectly*. The axes in the resulting map are believed to represent the underlying dimensions or benefits consumers are seeking for in the product set.

### *Actionability of elicited needs*

Category appraisal facilitates product development by enabling product developers to visualise the key elements of the market structure for a product category. Maps provide information on product characteristics by summarising how consumers perceive each product on each *product characteristic*. In addition, maps provide information about *benefits*. The axes of the map are presumed to be the underlying dimensions that best characterise how consumers differentiate between products.

## **Conjoint analysis**

In a conjoint task, respondents are asked to express their preference towards experimentally varied product profiles (Green and Srinivasan, 1978). Baker and Burnham (2002), for example, applied conjoint analysis to explore consumer preferences for food products that are the product of genetically modified organisms (GMO). Cornflakes cereal was described by three attributes (brand, price, source of corn used to make cereal) at two or three levels (e.g. for source: GMO corn and non-GMO corn). A hypothetical product was defined by choosing one attribute level for each of the three attributes. Each respondent was asked to rate 12 hypothetical products on a scale of 1 (being least preferred) to 10 (being most preferred). Data analysis showed the relative importance of each attribute in a respondent's preference function.

### *Information source for need elicitation*

Conjoint analysis is *product-driven*. Products or product concepts are represented by their attributes, where each attribute can have two or more alternative levels. The goal of the study is to find out which attribute and attribute levels consumers prefer and how much they value the attributes. Characteristic of conjoint analysis is that the products are primarily hypothetical and hence more or less *unfamiliar* to respondents.

### *Task format of conjoint analysis*

From a set of products from a particular category is information available on a number of attributes (relevant characteristics). The participant has to consider all information in order to reach some conclusion about the alternatives. The major research question is how consumers handle the available attribute information in order to arrive at an evaluation of alternative products (Westenberg and Koele, 1994). The task formats of conjoint analysis are many and varied. For example, participants might be asked to rank-order all product profiles in terms of preference. Alternatively, they might be presented with many groups of attribute bundles and asked to select one of each group, or, they might be given pairs of concepts and asked to select between the concepts (Dahan and Hauser, 2002). In all cases, data collection is highly *structured*, because response categories are fixed and require no further quantification on the part of the researcher. These task formats have in common that they require the evaluation of *multiple products* and they are *after preference judgments*. These overall preferences for the products are decomposed into the utility associated with different attribute levels making up that product. As such, consumer needs are *indirectly derived*.

### *Actionability of elicited needs*

Conjoint analysis takes explicitly into account the trade-offs consumers make in their choices between products. They show the relative importance of levels of product attributes on consumer preference. Hence, these methods provide primarily information at *product characteristic* level, although it is also possible to include consumer benefits.

### **Empathic design**

Empathic design is a form of observational research in which consumers are watched using products in their own environment. The basic premise of this method is that by spending time with consumers, the developer develops empathy for the problems consumer encounter in their daily life. Leonard (1995) gives the example of a product developer of breakfast cereal, who found out that the little rounds of oats are as likely to be carried around in bags by their parents as a handy snack to calm down toddlers as they are to be put in the breakfast bowl of milk. Although consumers did not complain or asked for a new product, the product developer came up with the idea for a new cereal snack for children.

### *Information source for need elicitation*

Empathic design is *need-driven*. What drives the elicitation of consumer needs is the recognition of the researcher that something can be improved in consumers' current behaviour. No stimuli are offered to participating consumers. The key premise of empathic design is that new product concepts are based on a deep (empathic) understanding of unarticulated consumer needs. This deep understanding is essentially based on actual observed consumer behaviour.

### *Task format of empathic design*

In contrast to consumer research relying on self-reported behaviour and opinions, the task format of empathic design is based on observing consumer behaviour in routine behaviours. By precisely observing consumers' behaviour, the assumption is that product developers can more easily identify opportunities for products in response to perceived needs. The data gathered in empathic design is often in the form of photographs or videos. As a result, the data collection is highly *unstructured* requiring further (subjective) interpretation on the part of the researcher. No judgement of preference for products is asked of consumers. Hence, consumer needs are *indirectly derived*.

### *Actionability of elicited needs*

Observation is believed to be helpful not only in understanding how products are actually used, but also the motives underlying their use. The assumption in the empathic design methodology is that observation reveals what the consumer is really trying to achieve in using a product. As such empathic design aims at uncovering the *benefits* consumers are seeking for in products. Consumers are presumed to be unaware of their real needs, because they successfully adapt to their surroundings. Observants look for cues, which show a hidden or latent need. Cues can be frustrations with a product or situation, confusion, or unexpected usage of products. To improve a translation of consumer needs into new products concepts, the empathic design method requires that the observation is carried out by people who have a deep understanding of the potential of a set of technologies, for example product developers such as engineers and designers (Leonard, 1995).

### **Focus group**

A focus group is a group discussion technique in which a moderator focuses the attention of a group of 8-12 persons on a predetermined set of topics in order to discuss views and opinions. For example, focus groups can be done to identify the most important drivers of consumer choice for a particular product class or discuss a set of new product concepts.

### *Information source for need elicitation*

Although Urban and Hauser (1993) recommend focus groups in all new product development processes, focus groups applied during the NPD process are primarily used for the exploration of new concepts and the identification of new opportunities (McQuarrie and McIntyre, 1986; Sheth, Mittal and Newman, 1999)<sup>4</sup>. Focus group can be either *product-driven* in case reactions are obtained to both new and existing products, or *need-driven* in case the obtained information consists of experiences and more general motivations for behaviour. Stimuli provided can be either *familiar* or *unfamiliar*.

### *Task format of focus group*

Focus groups are interactive discussion groups. They are chosen over personal interviews because of this interactive effect: statements of one participant can trigger comments by others. These statements of participants can relate to either *preference* or *perception*, although the focus is on preference judgements in order to get insight into how attractive a new product (concept) is to prospective consumers. Probing the group members to evaluate the product (concept) shown to them directly derives consumer needs. Typically, several groups are run and the results are interpreted judgementally by the observers and the moderator. Participants are not constrained to fixed response categories, which makes the

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<sup>4</sup> Focus groups can also be used for idea generation (e.g. Fern, 1982).



data collection *unstructured* requiring further subjective input from the researcher in qualitative and quantitative interpretation.

#### *Actionability of elicited needs*

In principle, anything can be discussed, although the focus is primarily on *product characteristics* and accompanying *consumer benefits*. However, specificity in level of verbalisation is generally very limited for consumers. The purpose is explorative in that it aims to identify all potentially relevant issues, not just the translation into product design.

#### **Free elicitation**

Free elicitation is a personal interviewing technique in which the respondent is asked to express the attributes he/she considers relevant in the perception of a particular product set. In free elicitation, the researcher is mainly interested in the content and organisation of consumers' existing knowledge of a particular product category.

#### *Information source for need elicitation*

The underlying theory of free elicitation is that of the memory schemata concept (Collins and Loftus, 1975). Schemata are knowledge structures, which people form during their life. Each schema consists of previously acquired knowledge and organisational structure that interrelates the content. Free elicitation is *product-driven*. The stimulus cues that are presented to participants are *familiar* because they are intended to trigger or activate memory schemata. A free elicitation method elicits product attributes through recall from memory.

#### *Task format of free elicitation*

Generally, one product or product class is discussed at once. The collection of data is *unstructured*, as respondents are free to say anything that comes to mind when presented with a stimulus. The data require further (subjective) interpretation on the part of the researcher. The focus is on revealing important *associations* that people have with certain products. Free elicitation is also called 'direct elicitation', because needs are *self-articulated* by the consumers.

### *Actionability of elicited needs*

Free elicitation mostly elicits product attributes at a concrete level: *product characteristics*. A technique such as free elicitation is believed to lead to a stronger focus on idiosyncratic and intrinsically relevant attributes and to less focus on extrinsic product differences (Bech-Larsen and Nielsen, 1999). However, in comparing three marketing research techniques (including free elicitation and Kelly's Repertory Grid), Steenkamp and Van Trijp (1997) found that free elicitation results in more attributes and a higher proportion of abstract attributes (i.e. benefits).

### ***Information acceleration***

Information acceleration (IA) is a concept testing method employing multimedia stimuli and experimental set-ups. Urban, Weinberg, and Hauser (1996) implemented this method to assess the demand for a new electric automobile. A virtual buying environment was created that simulated the information accessible in a real buying environment in the future. The respondent could interact with a multimedia computer, in which not only the new car was simulated, but also brochures, interviews with consumers, articles in magazines like Consumer Reports and a showroom encounter. In the showroom encounter, respondents could have interactions with a salesperson or examine the car from all angles. In this virtual environment, consumer data on purchase intentions was gathered in order to forecast consumers' response to this totally new product. Current applications of this method include personal communication systems, new pharmaceutical drugs, and theme parks.

### *Information source for need elicitation*

Information acceleration is *product-driven* in that a 'virtual' prototype or product concept is used to obtain consumer feedback. The data collected from consumers is used in models to predict sales potential. The technique is specifically developed to test really-new products. In the past it was applied with high-tech cars and computers. These new concepts were *unfamiliar* to consumers, because they generally represent new technologies and require consumer learning. IA, however, explicitly tries to make the unfamiliar familiar, by providing information.

### *Task format of information acceleration*

The basic aim of IA is to place consumers in a virtual buying environment that simulates the information that is available to the consumers at the time they make a purchase decision. In this virtual buying environment, participants are conditioned for future situations, user experience is simulated and consumers are encouraged to actively search for information on the product. Hence, information about *multiple products* is available for evaluation, for example by offering simulated showrooms in which the participant can 'walk around', and articles in magazines such as consumer reports. At the end of the session, consumer needs are *directly*

*derived* by measuring participants' attitudes, *preferences*, and purchase intent. The data collection can be considered as *structured*, because choice alternatives for respondents are all specified and quantitative in nature.

#### *Actionability of elicited needs*

According to its developers, IA can be used to 'accelerate' the majority of the market to where the lead users are positioned now (Urban and Hauser, 1993). Latent needs are assumed to emerge at a conscious level at the moment that the new product is shown to consumers. The aim is to provide concrete information to product developers in an early stage, so at the level of *product characteristics* and *benefits*.

#### **Kelly repertory grid**

Kelly's repertory grid is a personal interviewing technique used to elicit the constructs by which consumers structure and interpret a product category. Constructs (e.g. attributes of products) are elicited by repeatedly confronting a respondent with triads of products drawn from a large set and asking which two products are alike and different from a third. For example, Russell and Cox (2004) let consumers assess 14 meat products using repertory grid methodology. Respondents were presented with a series of triads (groups of three pictures of meats) on a computer screen. The interviewer asked the participant to elaborate on the reasons mentioned. Data were analysed by deriving a perceptual map of the meats of all participants' data. One of the maps showed that a particular group of consumers distinguished between beef sausage and lamb chops on the constructs health and expensive/cheap.

#### *Information source for need elicitation*

Kelly's repertory grid is *product-driven* as the first stage in this method is to choose a set of products which are consistent with the objectives of the study and the targeted constructs to be elicited from participants. The technique is applied to generate aspects on which people differentiate between products. The technique applies *familiar* stimuli, because an initial screening of the total set of stimuli is required to remove unknown stimuli (Sampson, 1972).

#### *Task format of Kelly repertory grid*

The method consists of personal interviews with consumers in order to elicit the content and hierarchical structure of the subjective meanings, in the form of bipolar constructs that they attach to *multiple products*. The appropriate number of stimuli varies from 8 to 30 (Sampson, 1972). Kelly argued that in order to understand what someone means by a construct or concept, it is necessary to know against what the person contrasts that concept. Primarily, the task format in this method consists of 'triading' which involves randomly selecting three products. Consumer needs are *directly derived* by asking participants to describe in a short

phrase or sentence how two of them are alike and different from the third. Consequently, the collection of data can be considered *unstructured*, as there are no suggested answer alternatives and participants answer in their own words. The data require categorisation and quantification on the part of the researcher. The personal interview procedure focuses on identifying key constructs underlying product *perception*.

#### *Actionability of elicited needs*

The technique primarily reveals *product characteristics*. Sampson (1972) applied the repertory grid technique and concluded that 'there is a danger of ending up with a set of responses that are relatively superficial, primarily physical or functional rather than psychological'. Steenkamp and Van Trijp (1997) found that the repertory grid technique appeared to yield fewer attributes than the free elicitation technique, and these attributes were proportionally more frequently characteristic attributes with a lower level of articulation.

#### **Laddering**

Laddering is a personal interviewing technique used to understand consumers' knowledge structure regarding a particular product (category). A means-end chain is a knowledge structure that links a consumer's knowledge about product attributes with their knowledge about consequences and values.

#### *Information source for need elicitation*

In the laddering interviewing technique, a *product-driven* stimulus is employed to elicit consumer needs. In essence, laddering interviews typically begin with distinctions made by the individual participant concerning perceived, meaningful differences between brands or products. The presented stimuli are generally *familiar* to participants.

#### *Task format of laddering*

The task format of laddering can be characterised by the *evaluation of multiple products*, after which the interviewer obtains the needs by *directly* and repeatedly 'why'-probing of the participant. The data collection is *unstructured* because the participant's subsequent answers determine the direction of the interview. A researcher-based categorization of responses is required before data can be used for further analysis. The actual laddering interview starts after both *similarity and preference judgements*, depending on the type of technique used to elicit distinctions between products. Reynolds and Gutman (1988) recommend three general techniques of eliciting distinctions: (1) Kelly's triadic sorting technique, (2) preference-consumption differences in which participants provide a preference ordering of a set of products, and (3) differences by occasion in which participants provide a preference ordering of products within a personally meaningful context to facilitate the making of distinctions. The

authors recommend that the interview include at least two distinct methods of eliciting distinctions to make sure no key element is overlooked.

#### *Actionability of elicited needs*

Means-end chain approaches like laddering examine the type of concrete *product characteristics, benefits* and *values* within consumers' cognitive structures for a product class. The output provides information about the specific linkages between product characteristics and consumers' value orientations.

#### **Lead user technique**

In the lead user technique, selected consumers are involved who have advanced knowledge about the product and usage. By creating solutions to their own problems, they are believed to be able to predict new and successful products. For example, if the trend toward increasing consumption of 'convenience foods' is selected, a survey of consumer preferences could identify those on the leading edge of that trend.

#### *Information source for need elicitation*

The lead user technique can generally be regarded as a technique in which the stimuli used are *need-driven*. The aim is not, primarily, to elicit consumer needs, but to elicit specific 'solution data' from lead users. Sometimes lead users develop new solutions themselves by applying existing commercial products and components in ways not anticipated by their manufacturers. Sometimes they have even developed complete new products responsive to their needs. In that case, these self-made products are the starting points for the problem-solving sessions, and hence the used stimulus for need elicitation can be considered *product-driven*, but then with *unfamiliar* concepts from a company's point of view.

### *Task format of lead user technique*

R&D professionals usually conduct the lead user technique, as lead users are explicitly involved in the actual development process of the product with R&D personnel. Basically, a sample of lead users is brought together with company engineering personnel to engage in group problem-solving sessions. Since the data collection takes place during creative sessions, it can be considered as highly *unstructured*. The outcome of these sessions is one or more product concepts, which are subsequently judged by session participants to be both responsive to both consumer and company needs.

### *Actionability of elicited needs*

The lead user technique typically elicits *product characteristics*. In particular, lead users are assumed to obtain the highest net benefit from a potential new product and hence are the ones who have devoted the most resources to understanding the consumer needs and (unresolved) problems surrounding it. In problem-solving sessions with R&D personnel of the company, lead users statements about their needs and problems are presumed to contain more or less information about possible solutions. In particular, lead users' experience with the need or problem is believed to make discussion with them valuable for developing new products.

### **Zaltman metaphor elicitation technique**

Zaltman metaphor elicitation technique (ZMET) is a projective technique in which consumers create collages characteristic of their feelings and experiences about a product or research topic. They then get together with researchers to explain the images selected and associated experiences. Christensen and Olson (2002) illustrated ZMET in the field of mountain biking. In this study, participants were required to provide pictures and images that capture what they seek in mountain biking. The analysis of resulting collages revealed four collective orientation or themes about mountain biking shared among respondents, which include 'riding for challenge, thrill', 'sharing experiences and connecting with a group' and 'escaping to nature'.

### *Information source for need elicitation*

The driving stimulus in ZMET is primarily *need-driven*. Basically, participants are given a set of guidelines and instructions about a research topic, which can be a brand name, a corporate identity, a service concept, or product use situation. The elicitation of consumer needs can be *product-driven* in case a product design is selected as research topic. In this case, the product is *familiar* to participants, because otherwise they would not be able to elaborate on it.

### *Task format of ZMET*

Participants are asked to choose at least eight photographs or other visual images taken from magazines, catalogs, or photo albums that represent their feelings on the research topic. Participants are given several days to consider the research topic before they will be interviewed. The personal one-to-one interview includes a selection of a variety of procedures. For example, participants are encouraged to tell stories about all of the images they chose and the connections among them. Later, participants' opinions and the pictures are combined in the form of expressive montages. As such the task format can be considered as an *association* task. Each picture is seen as a metaphor that expresses one or more important meanings about the research topic. Participants are requested to *articulate themselves* important cognitive (thoughts) and emotional (feelings) aspects of that mental model. The data collection is highly *unstructured*, because participants are not constrained to certain answer categories. The researcher will further need to interpret the raw data before they can be used for further analysis.

### *Actionability of elicited needs*

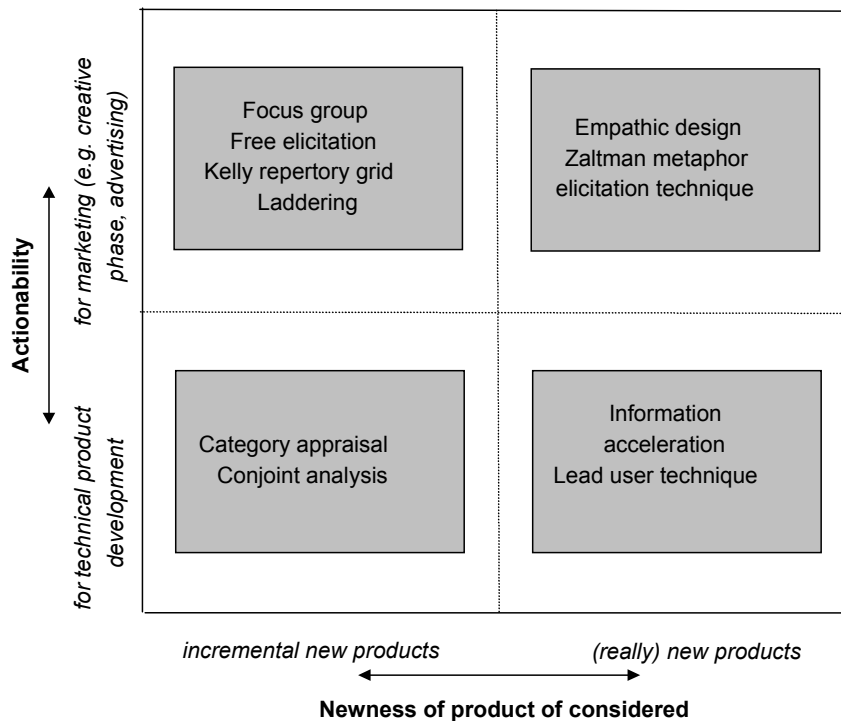
ZMET typically elicits consumer needs at the level of *benefits* and *values*. According to its developers, ZMET can be used to elicit consumers' meaning about the personal relevance of a topic and then map those meanings as mental models. The broader term 'mental models' is chosen to allow other meaning representations to be included, such as attitudes, emotions and feelings, symbols, actions, goals, consumption visions of anticipated experiences, and representations of sensory experience such as touch, taste and smell. This fits with the underlying assumption of ZMET that thoughts as image based. Similarly to the laddering technique, ZMET aims at building the connections between elements as in a hierarchical map. ZMET, however, claims to understand more deeply the linkages themselves that form the consumers' mental structure. For example, besides consensus maps with mental models at an aggregate level, ZMET provides detailed maps at a finer level of resolutions compared to the mapping of the original constructs.

## **2.4 Conclusion and implications**

The aim of consumer research methods early in the NPD process is to make the voice of the consumer heard up front to facilitate the design of consumer relevant new products. Research on success and failure factors in NPD (e.g. Cooper, 1988) have identified the up front homework as a key success factor, yet often overlooked or underdeveloped. We have identified a comprehensive classification scheme of performance dimensions to help researchers in the area in their choice among them. Our review and classification reveals that the methods primarily differ in their degree of actionability for marketing versus R&D and their ability to develop 'out of the box' ideas. The important implication is that the methods are not

direct substitutes. Rather, their appropriateness depends on the purpose for which they are implemented (support marketing versus support R&D) and the innovation strategy, which is pursued (winning in existing well-defined markets versus building a new market through radically new products). In figure 2.5 the ten reviewed methods are positioned against two dimensions: *newness of product considered* and *actionability*.

**Figure 2.5: Recommended consumer research methods for opportunity identification based on newness of product considered and actionability for technical product development or marketing**



All methods situated at the left hand side of figure 2.5 (i.e. focus group, free elicitation, Kelly repertory grid, laddering, category appraisal, and conjoint analysis) are particularly appropriate for incremental new products; products that are repositionings or updated versions of existing products. This optimisation of products is a continuously needed activity to keep up with competitors and stay cost-efficient. All these methods are product-driven and consumer needs are primarily elicited with familiar stimuli. Consequently, they provide insights that are limited by the particular product(s) included in the study- that is, they elicit consumer needs within an existing framework of what is already available on the market. Consumers can generally give reliable judgements about new products that are relatively similar to familiar products. Hence, the advantage of these methods lies in their capacity to capture current needs and desires and optimise existing products accordingly. However, their limitation lies in the fact that it is difficult



to elicit unfulfilled needs by analysing preferences for products currently existing in the market. Although they can give clues of which benefits people are seeking in the near future, these approaches primarily refer to consumer needs that are widely understood by competitors in a market. A risk of relying on them is that they are likely to give companies only 'me-too' ideas, which hardly excite the consumer. Category appraisal and conjoint analysis are highly actionable for technical product development, because they allow product developers to understand how consumer needs interrelate and translate to the 'physical' domain of product characteristics. Laddering, Kelly repertory grid, free elicitation and focus group are more appropriate for marketing purposes, as they reveal more abstract consumer needs and values. These more abstract needs and values are closer to what drives consumer choice behaviour. However, they are too abstract and allow too many degrees of freedom for unambiguous translation into product design.

The right hand side of figure 2.5 involves methods more appropriate for (radically) new products and thinking outside the box. Really new products are most risky to develop, but at the same time, the type of products, that, if it succeeds, yields the largest gain. However, these types of products are much more difficult to evaluate because they do not fall into any established current category and probably combines several technologies not currently available together (Eliashberg, Lilien and Rao, 1997). Simply asking consumers what they want is not likely to elicit unfulfilled needs, because consumers tend to mention needs that are already catered for in the market. As a result, highly complex, radically new products pose special challenges to consumer research. When considering really new to radical new products consumers have to make major modifications to their choice processes (e.g. Goldenberg, Lehmann and Mazursky, 1999). In particular, consumers need to change their behaviour in order to adopt the product. Hence, the major difficulty in conducting consumer research is the consumer's lack of experience with the product. Confronting consumers with unfamiliar products (e.g. a really new concept) may lead to information that has reduced predictive validity. After all, for new products consumers have less information in memory to guide them and expressions of preference are often constructed at the time that the respondent is asked to give a judgement. As a result, consumers may change their opinion by the time the product will be introduced.

Two groups of methods can be distinguished on the basis of their actionability. The lead user technique and information acceleration both try to access consumers' unspoken and latent needs, but with a clear link to physical 'solutions' against those needs. Information acceleration explicitly takes into account that consumers might not have the level of product knowledge that is necessary for judging new products. By creating a simulated future environment, respondents are guided in understanding what a new product can do for them. The lead user technique uses a sample of consumers whose present needs are expected to become general in the marketplace months or years in the future. Moreover, lead users may have developed solutions to problems encountered with existing problems. However, relying on lead users can also have its risks. Their needs may be of limited appeal, perhaps applicable only to other lead users (Ulwick, 2002). ZMET and the empathic design technique are as well appropriate for really new products. They are both need-driven in that they focus on understanding consumer problems or motivations. They specifically focus on the more

latent non-articulated needs and hence provide detailed insight into what really drives consumer behaviour. This information is highly actionable for marketing purposes (e.g. communication strategy). However, as a downside, this abstract insight requires additional methods for translation into actual physical product design.

In sum, consumer research in the early stages of the NPD process allows product developers to go farther and deeper in understanding consumer needs, often well beyond what one would understand without them. As there are many consumer research methods, we hope that our review helps product developers in selecting the most appropriate ones.

## Appendix 1

### Glossary of frequently used terminology in consumer research for product development purposes

Terminology	Definition*
Actionability of information	The ability of information to indicate specific actions to be taken in order to achieve the desired objective
Consumer benefits	A product attribute expressed in terms of what the consumer gets from the product rather than its physical characteristics or features. Benefits are often linked to specific product characteristics but they need not to be
Consumer values	The desired end-states of life, the goals one lives for
Development stage	Stage in the NPD process where product concepts or prototypes are physically made.
Familiarity	The number of product-related experiences that have been accumulated by the consumer
Launch	Stage in the NPD process in which a new product is taken to the market (commercialized)
Means-end chains	Consumer knowledge structure that links a consumer's knowledge about product attributes with their knowledge about consequences and values
Need elicitation	Process of identification of consumer needs
Need-driven stimuli	Consumers' needs and problems are cues to start off elicitation of needs
New product concept	A clearly written and possibly visual description of the new product idea that includes its primary features and consumer benefits, combined with a broad understanding of the technology needed
Opportunity identification stage	Initial stage in the NPD process where ideas for new products are generated and screened
Optimization stage	Stage in the NPD process in which the new product is tested in order to meet the needs and requirements of consumers
Product characteristics	Measurable, manipulable and physical properties of products under control of technical product developers
Product-driven stimuli	Products are cues to start off elicitation of consumer needs

*Based on: PDMA Glossary for NPD, Belliveau, Griffin and Somermeyer (2002); Rochford (1991); Shocker and Srinivasan (1979); Alba and Hutchinson (1987); Sheth, Mittal and Newman (1999)*



# Chapter 3

## **Consumer-oriented functional food development: how well do functional disciplines reflect 'the voice of the consumer'?<sup>5</sup>**

### **Abstract**

Food innovation can have its source in either superior understanding of consumer demand (pull) or in superiority at the supply side (science and technology push). However, in either case market success depends on the degree to which the new product reflects unmet consumer needs. The present study provides a framework, which allows obtaining relevant consumer and expert input in the early stages of functional food development. By systematically generating and rigorously screening a large set of functional food concepts both inside (functional food experts) and outside (consumers) the company, the framework prevents that high potential opportunities are overlooked. This in turn provides a platform for product developers to discuss and decide upon which opportunities to pursue. The illustration of the framework shows the extent to which expert judgments are an accurate reflection of consumer demand.

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<sup>5</sup> This chapter is published as Van Kleef, E., Van Trijp, H.C.M., Luning, P., and Jongen, W. (2002). Consumer-oriented functional food development: how well do functional disciplines reflect the 'voice of the consumer'? *Trends in Food Science & Technology* 13, 93-101.

### 3.1 Introduction

The food industry increasingly realises that functional foods have the potential to add value to their business. While the precise size of the functional foods market is difficult to determine, there is general agreement that it has large potential for growth (Sloan, 2000; De Groote, 2001). Consumers more and more believe that foods contribute directly to their health (Young, 2000). This increasing consumer awareness in combination with advances in various scientific domains, provides companies with unique opportunities to develop an almost infinite array of new functional food concepts.

Functional food development is subject to much more scientific standards and food technological complexity than traditional food development, which makes that till now research has been primarily concerned with establishing the scientific bases in health, nutrition and food processing (Diplock, Aggett, Ashwell, Bornet, Fern, and Roberfroid, 1999). Although successful food innovation can have its source in superiority at the supply side (science and technology push), it can as well have its source in superior understanding of consumer demand (pull). Whatever the source, ultimate market success depends on the degree to which the new product reflects unmet consumer needs (Atuahene-Gime, 1995; Kahn, 2001). Many companies, however, are struggling with how to translate the plethora of scientific opportunities into successful new products (Van den Broek, 1993; Hollingsworth, 1999). Despite considerable promotional expenditure and effort being put into explaining the health benefits to consumers, many products face problems on the market, and some have even been withdrawn (Hilliam, 1998). Functional food innovation is, by its very nature, a highly risky undertaking. But although costs are high, so are potential paybacks. Two sources of risks in strategic decision-making in product development can be distinguished (table 3.1: cf. Eliashberg, Lilien, and Rao, 1997; Van Trijp, 1999). *First*, resources are invested in a new product that appears to be a failure in the market place (type-1 error). *Second*, a potential successful functional food exists, but the idea for the new product is undeservedly screened out or overlooked. Even though companies are not always aware, these absent ideas can be considered opportunity losses or missing market opportunities (type-2 error).

**Table 3.1: Type-1 and type-2 errors in new product development (cf. Eliasbergh, Lilien, and Rao, 1997; Van Trijp, 1999)**

		External reference	
		Consumer acceptance of new product will be....	
		<i>low</i>	<i>high</i>
<b>Internal reference</b> According to science and technology base, new product will be.....	<i>success</i>	Type-1 error; Unjustified investment	Opportunity agreement
	<i>no success</i>	Non-opportunity agreement	Type-2 error: Opportunity losses

The problem is that it is hard to predict which new product opportunity should be invested in to develop them into marketable consumer products. This is why external reference in the form of consumer studies is needed and generally executed for the purpose of reducing decision uncertainty. Reducing the number of type-1 errors in the face of consumer evidence is of crucial importance to prevent that a lot of money is unjustifiably invested in a new product from which is thought that consumers will accept it. The majority of consumer research in new product development (NPD) tries to prevent these types of erroneous decisions. Product testing research, for example, helps to screen out product concepts that have limited consumer acceptance in the market place. In addition, they enable standardising and rationalising investment and product decisions. However, by essentially searching for negative feedback, they primarily focus on optimisation of new product ideas against existing market supply. Although this is an important objective, there is an inherent danger to it. Successful NPD strongly depends on the quality and quantity of new product ideas. To prevent type-2 errors, companies should pro-actively search in the neighbourhood of existing market supply to identify opportunities, which deliver against consumer needs currently not catered for by products in the market place. New functional foods should differentiate themselves from available products: they should be new and distinctive. This reflects a more creative, pro-active side of product development as a complement to confirmative research. In stead of testing only those product ideas already agreed upon and shared by experts internally, it is of crucial importance to obtain a new and stimulating perspective on product ideas from outside the company through consumer feedback.

So, successful functional food innovation depends on the ability of companies to balance rigorously internal testing of functional food concepts to prevent unjustified investments (type-1 errors) with pro-active searching in the neighbourhood of present product delivery in the market place to prevent 'myopia' or opportunity losses (type-2 errors). Hence, the present study provides a framework that takes a structured and systematic approach to both concept generation and concept screening. Our approach is first of all inspired by theories of creativity in new product development, that claim that including a large variety of new concepts is essential for expanding the solution space and hence the production of many novel concepts (Rochford, 1991). In addition, successful functional food development requires

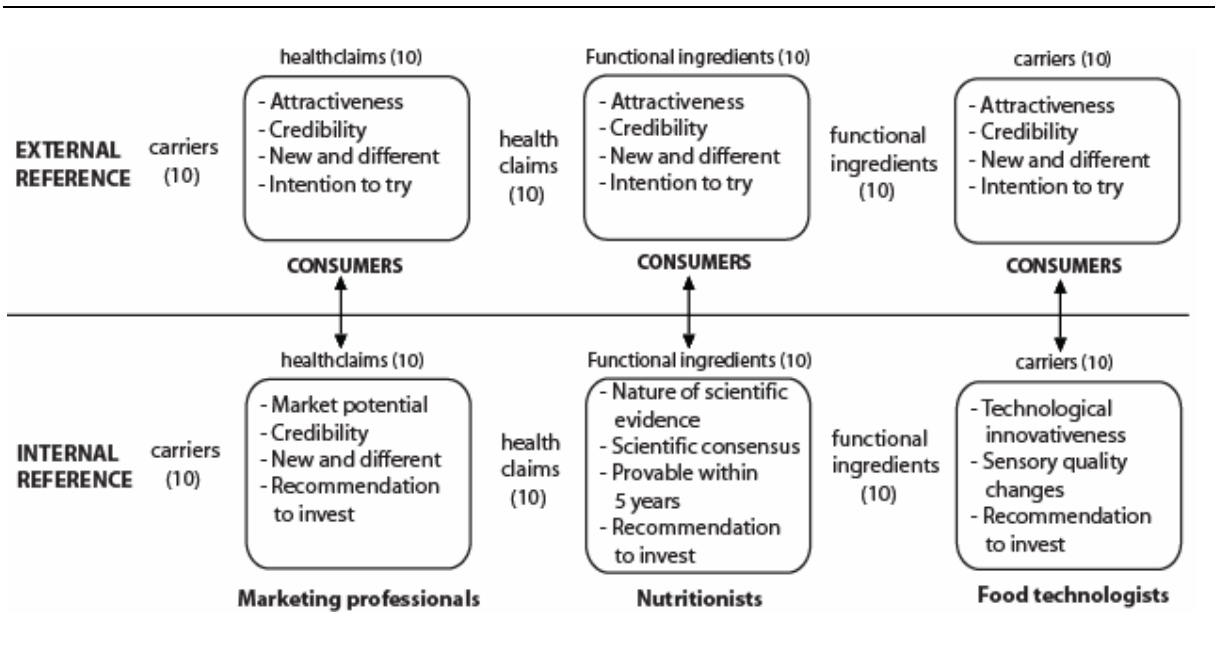
joint efforts from experts within the company and relevant consumer input from outside the company (Griffin and Hauser, 1996). It is widely known that the diversity of expertise needed in the development process often creates serious barriers for shared understanding. In this respect our approach is similar to Quality Function Deployment (QFD), which as well aims at facilitating mutual commitment and communication across functional disciplines. Therefore, besides expert input (internal reference) relevant consumer input (external reference) on opportunities will be obtained. This in turn provides an analysis of internal-external reference discrepancies. In other words, it will show the extent to which experts' judgements are an accurate reflection of consumer demand. Hopefully, this will provide a useful platform for product developers to discuss and make decisions about which functional food opportunities to pursue.

### **3.2 Study design**

Figure 3.1 summarises our study design. Each set of measures between the brackets represents a subset of measures for a particular group of functional food concepts. Listed are the relevant measures obtained from both consumers (external reference) and experts (internal reference) on a large set of functional food concepts.



**Figure 3.1: Study design showing obtained measures from consumers (external reference) and functional food experts (internal reference)**



**Stimuli**

In this study, functional foods are defined as concepts consisting of three dimensions: carriers (e.g. food products or pills), functional ingredients (e.g. vitamin D) and health claims (e.g. 'reduces the risk of heart diseases'). Based on an extensive survey of literature and interviews with experts (i.e. director food market research agency, and two nutritionists), ten elements were selected for each dimension (table 3.2). To not narrow down too much, we included as well health claims currently not yet legally allowed. Although these do not represent options for instant market introduction, these stimuli can help to stimulate more strategic thinking 'outside the box' by experts.

**Table 3.2: Selected elements for sets: health claims, functional ingredients and carriers**

<b>Health claim</b>	<b>Functional ingredient</b>	<b>Carrier</b>
1. Protects against damage to skin from UV-irradiation	1. Active biocultures (like the lactic acid bacteria Bifidus)	1. Brown bread
2. Gives extra energy	2. Anti-oxidants (like extracts of grapes, onions or tea)	2. Bar of chocolate
3. Helps maintaining healthy cholesterol levels	3. Calcium	3. Chewing gum
4. Helps keeping a youthful appearance	4. Folic acid	4. Margarine
5. Strengthens the natural defence of the body against frequently occurring diseases (like a cold)	5. Medicinal herbs (like Echinacea)	5. Meat replacer (like vegetarian burger or stir fry mix)
6. Reduces the risk of certain types of cancer	6. Unsaturated fatty acids (like linolenic acid)	6. Pills
7. Reduces the risk of osteoporosis	7. Vitamin C	7. Ice-cream
8. Reduces the risk of dementia	8. Vitamin D	8. Soup
9. Reduces the risk of heart diseases	9. Vitamin E	9. Tea
10. Reduces stress	10. Fibres	10. Yoghurt

### **Procedure**

Functional food concepts were offered to respondents as so-called mini-concepts of two dimensions (cf. Durgee, O'Connor and Veryzer, 1998), resulting in a set of 300 so-called mini-concepts (i.e. 100 health claim-carrier, 100 functional ingredient-health claim and 100 carrier-functional ingredient mini-concepts). For example, a health claim-carrier mini-concept was described as 'yoghurt, which helps to maintain a youthful appearance'. An example of a functional ingredient-health claim concept was 'a food with added anti-oxidants, which reduces the risk of heart diseases'. Finally, 'chewing gum with added vitamin D' is one of the 100 carrier-functional ingredient mini-concept descriptions. In this way, a large and diverse set of functional food mini-concepts was obtained, some available in the market place, most hypothetical. This trade-off approach allows for quantitative rating of all two-element mini-concepts by consumers and functional food experts based on a set of explicit screening criteria. Trade-off approaches like conjoint analysis are commonly used in marketing research (e.g. Johnson, 1974; Green, Krieger and Wind, 2001). The basic idea underlying these approaches is that by providing consumers with experimentally varied components of a product (concept), inferences can be made about ideal combinations of components in a product. The test of validity of our specific variant of the trade-off approach is reported in a separate paper (Van Kleef, Van Trijp and Van der Lans, 2001).

Consumer data collection took place at the central test facility of a Dutch market research agency. Respondents' ratings were given on five-point bipolar agree-disagree scales. All mini-concepts, displayed in verbal and visual format, were randomly presented on a computer screen. The entire task was randomly divided over two sessions, which took place at separate days (to avoid tiredness). Expert data was collected by face-to-face interviews of approximately two hours each. Each expert was provided with 100 cards representing the different mini-concepts of the matrix and was asked to answer individually on the posited question. Each question had a fixed number of response categories, which were put on the table in front of the respondent. For each card, the respondent was asked to indicate their judgement by putting it onto one of the response categories. Respondents were free to revise their previous choices until all concepts had been assigned. Concept cards were randomised across respondents to control for order and fatigue effects. It was emphasised that the respondent was expected to answer to the best of his/her knowledge and would remain anonymous.

### ***Respondents***

Consumer respondents (*external reference*) were recruited and selected on the basis that they considered health aspects of foods as an important criterion in their grocery shopping. All respondents had the primary responsibility for grocery shopping in their households. The final sample (n=50) included 27 females and 23 males with an average age of 35.1 (SD=9.3). The expert sample (*internal reference*) included 13 marketing professionals, 13 nutritionists, and 12 food technologists; all international reputable experts working at universities, research institutes and leading companies.

### ***Evaluative measures***

Consumers rated all 300 mini-concepts (3 x 100 mini-concepts) on two measures of desirability (i.e. 'attractiveness', 'intention to try'), and one measure of novelty (i.e. 'new and different'). In addition, 'credibility' was included, as this is an important determinant of functional food choices (Poulsen, 1999). Functional food experts captured different aspects of 'the voice of the consumer', depending on their domain-specific knowledge (e.g. market potential, legislative restrictions and food technological feasibility). To compare the three groups of experts, 'recommendation to invest' was included as common measure (figure 3.1).

### ***Data analysis***

Pearson correlation coefficients were calculated to investigate the relationship between sets of measures of consumers and groups of experts. In this way, the degree of (dis)agreement between consumers and experts was determined. In addition, by calculating  $R^2$  values, experts' ability to represent the 'voice of the consumer' was expressed as the variance in each expert measure that can be explained from the four consumer measures. For example, in case

the  $R^2$  value of market potential is 0.77, it indicates that 77% of the variation in market potential can be explained by the four consumer measures. This enables a comparison between expert groups in how well they represent the 'voice of the consumer'. Finally, within each expert group, domain-specific measures were regressed on 'recommendation to invest' to identify how they impact experts' judgements. The reported standardised regression coefficients beta allow for a direct comparison between coefficients concerning their relative explanatory power of the dependent variable. Finally, differences are examined by means of the t-test (Hair, Anderson, Tatham and Black, 1995).

### **3.3 Results**

First, it was explored how well internal experts agreed with consumer reality. Marketing professionals and food technologists are both equally able to reflect consumers' voice in their recommendation to invest, their answers explaining a high 77% and 55% of the variance in consumers' measures respectively (table 3.3). Both groups are not significantly different of each other (t-test=0.05; p=0.96). Nutritionists, however, are less able to represent consumers' opinion: the 23% variance explained by them is significantly lower (t-test=5.44; p=0.00) than the variance explained by marketing professionals and food technologists. The same conclusion can be inferred from the correlation coefficients between experts and consumers in table 3.3.

**Table 3.3: Similarity between experts and consumers expressed as Pearson correlation coefficients, and R<sup>2</sup> –values**

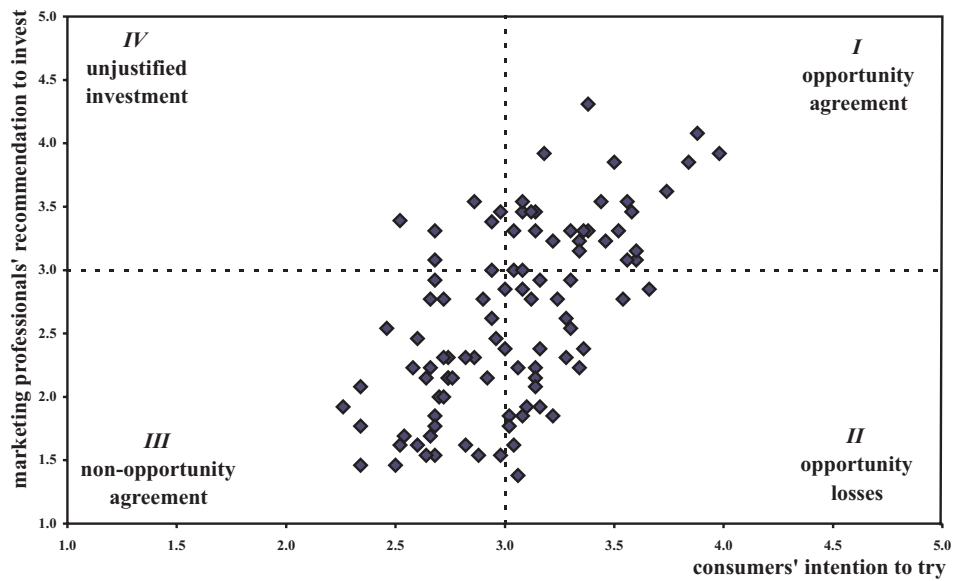
		Functional food experts										
		Health claim-carrier concepts <i>marketing professionals</i>				Functional ingredient-health claim <i>nutritionists</i>				Carrier-functional ingredient <i>food technologists</i>		
		Market potential	Credibility	New and different	Recommendation to invest	Nature of scientific evidence	Scientific consensus	Provable within 5 years	Recommendation to invest	Technological innovativeness	Sensory quality changes	Recommendation to invest
Consumers	Attractiveness	0.72*	0.69*	-0.66*	0.71*	0.52*	0.53*	0.51*	0.43*	-0.49*	0.52*	0.59*
	Credibility	0.85*	0.91*	-0.88*	0.85*	0.54*	0.58*	0.56*	0.44*	-0.62*	0.59*	0.71*
	New and different	-0.71*	-0.73*	0.83*	-0.64*	-0.44*	-.52*	-0.49*	-0.27*	0.54*	-0.39*	-0.45*
	Intention to try	0.62*	0.62*	-0.54*	0.61*	0.54*	0.55*	0.55*	0.48*	-0.43*	0.50*	0.54*
Consumer measures explained through individual expert measures (R <sup>2</sup> )		0.77	0.86	0.89	0.77	0.32	0.37	0.35	0.23	0.40	0.36	0.55
Expert measures correlated with recommendation to invest: R <sup>2</sup>		0.93*	0.94*	-0.85*	-	0.89*	0.83*	0.88*	-	-0.59*	0.72*	-
					0.90				0.84			0.59

\* Correlation is significant at the .01 level (2-tailed)

### ***Health claim-carrier mini-concepts***

Marketing professionals were considered the internal stakeholders in representing the 'voice of the consumer' regarding health claim-carrier concepts. Marketing professionals are fairly sensitive to consumer preferences in their recommendation to invest, as the majority of all mini-concepts is situated in the (non-)opportunity agreement quadrants of figure 3.2 ( $r=0.61$ ;  $p < 0.01$ ). Marketing professionals primarily base their recommendation to invest on the credibility of the mini-concepts (correlation coefficient =  $0.94$ ,  $p < 0.01$ ), and market potential (correlation coefficient =  $0.93$ ,  $p < 0.01$ ). The degree to which a mini-concept is considered 'new and different' has a negative correlation with their recommendation to invest (correlation coefficient =  $-0.85$ ,  $p < 0.01$ ). Overall, this is a good reflection of what consumers want, considering the high percentage of variance in consumer measures that can be explained with marketing professionals measures (77% till 89%). In addition, it is supported by the strong positive correlation coefficients between marketing professionals and consumers, for example concerning credibility ( $r=0.91$ ;  $p < 0.01$ ) and between supposed marketing potential and attractiveness ( $r=0.72$ ;  $p < 0.01$ ). Likewise, the degree to which consumers considered mini-concepts as 'new and different' positively related to the degree marketing professionals considered mini-concepts 'new and different' ( $r=0.83$ ;  $p < 0.01$ ). However, there are also disagreements between marketing professionals and consumers. Marketing professionals are more inclined towards pills as carrier for health claims than consumers ( $t=-4.4$ ;  $p < 0.01$ ). In contrast, indulgence carriers (i.e. chocolate, chewing gum, ice-cream and soup) are significantly higher valued by consumers than by marketing professionals ( $t=8.1$ ;  $p < 0.01$ ), and hence mainly situated in the second quadrant of figure 3.2.

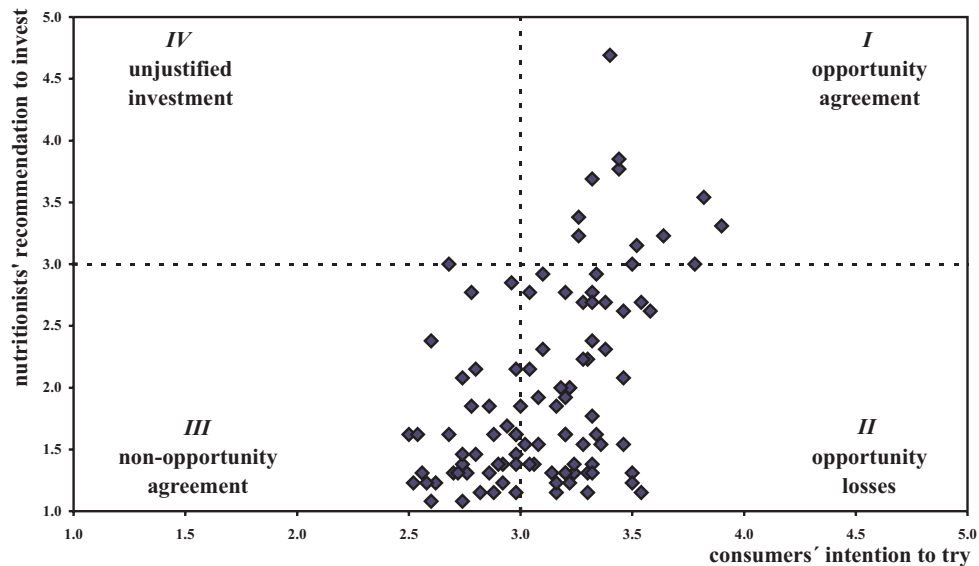
**Figure 3.2: Marketing professionals' recommendation to invest versus consumers' intention to try**



**Health claim–functional ingredient mini-concepts**

Nutritionists assessed all 100 health claim-functional ingredient mini-concepts, because their research domain includes the effects of functional ingredients on health and the occurrence of diseases (second group of measures in table 3.3). Figure 3.3 contrasts consumers' intention to try with nutritionists' recommendation to invest. In general, nutritionists are negative about investing in the majority of mini-concepts (68.4% of ratings  $\leq 2$ ) in contrast to consumers who are not reluctant against various mini-concepts. Nutritionists' recommendation to invest in a particular mini-concept is equally based on the degree of scientific evidence available (correlation coefficient = 0.89,  $p < 0.01$ ), the degree of scientific consensus (correlation coefficient = 0.83,  $p < 0.01$ ), and whether scientific evidence is collectable within 5 year (correlation coefficient = 0.88,  $p < 0.01$ ). Overall, their recommendation to invest does not reflect consumers' opinion very well. Nutritionists' assessments of scientific evidence, consensus among scientists and the degree to which a mini-concept is provable within 5 years can only partly be explained by consumers' evaluations, manifested by the moderately low  $R^2$  values (0.32; 0.37; and 0.30, respectively). Together with the somewhat low correlation coefficients of consumer credibility with these measures ( $r=0.54$ ,  $r=0.58$ ,  $r=0.56$ ;  $p < 0.01$ , respectively) this suggests that for consumers believability of a functional food does not necessarily relate to available scientific evidence.

**Figure 3.3: Nutritionists' recommendation to invest versus consumers' intention to try**

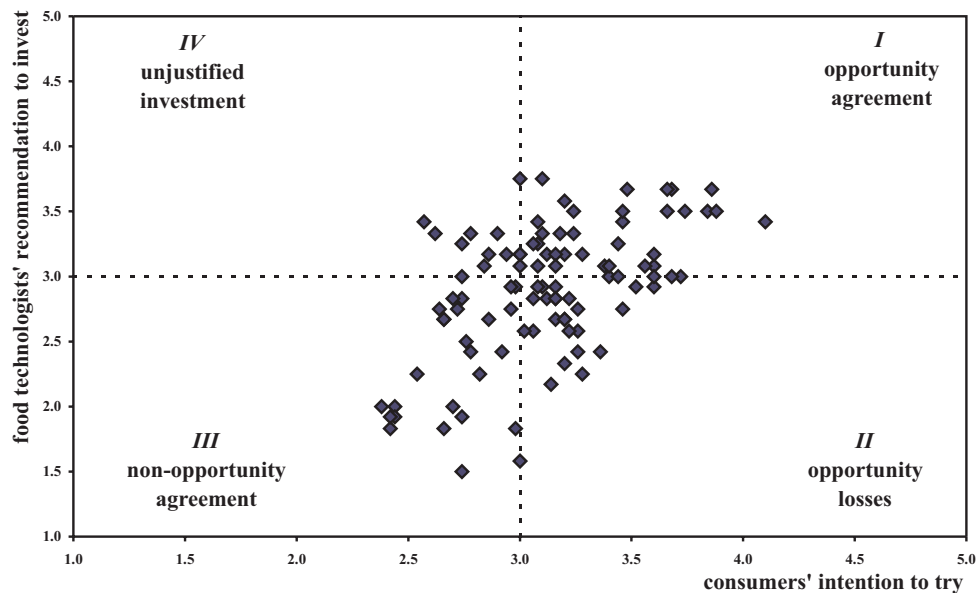


**Functional ingredient-carrier mini-concepts**

Food technologists evaluated functional ingredient-carrier mini-concepts as their domain includes the study on the role of different components in quality and functionality of food products. Basically, the majority of mini-concepts in figure 3.4 is located in quadrant I and IV, indicating considerable foresight. Food technologists do not base their recommendation to invest on the technological innovativeness of mini-concepts (correlation coefficient = -0.59,  $p < 0.01$ ). No or positive sensory changes in product quality are correlated with their decision, although the  $R^2$  value of 0.59 shows their opinion can only partly be explained by these two measures. Furthermore, the degree to which consumers perceive a mini-concept as 'new and different' does not necessarily mean that the mini-concept is technological innovative according to food technologists ( $r=0.35$ ;  $p < 0.01$ ). Both groups could have thus a different perspective on 'new' in relation to functional foods. Similar to marketing professionals, however, the average recommendation to invest of food technologists in pills was significantly lower than the intention to try of consumers ( $t=-2.5$ ;  $p < 0.05$ ). This indicates that experts attach high potential to pills, even while consumers generally are not willing to try pills with certain added functional ingredients. In addition, consumers consider indulgence carriers like chocolate, ice-cream, chewing gum and soup as significantly more suitable carriers for several functional ingredients than food technologists ( $t=5.1$ ;  $p < 0.01$ ). This indicates that food technologists probably fail to foresee a new segment of functional food concepts.



**Figure 3.4: Food technologists' recommendation to invest versus consumers' intention to try**



### 3.4 Conclusion and discussion

Although the development of new functional foods is believed to be vital for many companies' survival and growth, at the same time it is a risky, complex and costly process. The costs of functional food regulatory approval approaches those now associated with drug regulatory approval (Belem, 1999). For successful functional food development, both consumer needs and opportunities originating in life sciences need to be taken into consideration from the earliest phases on (Plaami, Dekker, Dokkum and Van Ockhuizen, 2001). The present study provides a framework for concept generation and screening, which allows to obtain relevant consumer and expert input on a large set of mini-concepts. By its illustration in the functional food context, it has enlarged our understanding of the extent to which expert judgements are an accurate reflection of consumer demand.

The results of our analysis have several implications for the development of new functional food products. The preceding analysis revealed that although correlation exists between functional food experts and consumers, there is considerable room for improvement. Of particular concern is the observation of disagreement between experts and consumers in their valuation of certain subsets of mini-concepts. For example, consumers valued pills as carrier for health claims and functional ingredients significantly lower than marketing professionals and food technologists do. In addition, experts are less inclined to invest in carriers which consumers are willing to try (e.g. chocolate, soup). There are two potential reasons for this disagreement. A first reason for discrepancy might be that internal experts, in

particular nutritionists, are too distant from the market place. Therefore, it is important for functional food experts, as they explore opportunities, carefully incorporate the opinion of consumers. For example, continuous consumer research can help raising consumer awareness and bring them closer to consumer needs and wants. Conversely, consumers could as well lag behind in terms of what can be delivered. Uncertainty about new concepts may result in rejection, because consumers typically lack a useful frame of reference for evaluating really new product concepts (Veryzer, 1998). Obtaining consumer input in the development process, however, can help to better understand these issues so that product developers can overcome confusing or fear-raising aspects, for example in their marketing and communication activities.

Techniques to identify opportunities during the initial stages of the development process should play a key role in balancing consumer needs and preferences with technical realities and should also help to ensure that the new functional food incorporates the most recent and promising opportunities from life sciences to obtain a competitive edge. Our approach, in which both experts and consumers are contrasted on a set of relevant measures, provides a detailed and actionable diagnostic tool for discussions on how to balance 'what should be done' (from a consumer perspective) with 'what could potentially be done' (from a science/technology perspective). Similar to Quality Function Deployment (QFD), it supports better communication among functional disciplines by providing mutual commitment and responsibility of all stakeholders involved. To facilitate improved understanding of consumer preferences and preventing opportunity losses (type-2 errors), it is worthwhile for companies to consider the use of methods and tools that provide sufficient room for divergence in searching for concepts outside the scope of current product delivery in the market place. By including many hypothetical products ideas, our approach extends QFD as it provides a pro-active means to identify new product ideas that deliver against consumer needs that are not yet fulfilled by products currently in the market. Hopefully, this will provide a platform for product developers to discuss and decide upon which opportunities to pursue.

Besides preventing that no technical opportunities are left unscrutinized, our approach allows companies to truly understand which concepts consumers value and make investments accordingly. To illustrate the approach, this study presents an initial glance at the data at a more general level. However, further analysis can provide detailed diagnostic information about the feasibility state of each mini-concept to enable product developers to precisely identify and early anticipate bottlenecks in further development processes. For a particular consumer-desired mini-concept these bottlenecks might originate in lack of sound evidence for regulatory purposes or in the absence of required food technological skills. Important to note, however, is that legislative bodies are another important stakeholder that has to be taken into account. In addition, analysis of discrepancies between consumer desire and technical feasibility as well as within technical criteria can help to define priorities of the R&D programme.

# Chapter 4

## **Functional foods: Health claim-food product compatibility and the impact of health claim framing on consumer evaluation<sup>6</sup>**

### **Abstract**

Two studies are reported, which aim to strengthen the scientific underpinning of strategic decisions regarding functional food development, as to (1) which health benefits to claim, (2) with which product (category), and (3) in which communication format. The first exploratory study is a secondary analysis of ten different health claims systematically combined with ten different food carriers to evaluate their combined suitability for functional food positioning. The results show that consumers tend to prefer functional food concepts that primarily communicate disease-related health benefits in carriers with a healthy image or health positioning history. Study 2 examines health claim format and systematically varies the way in which specific health benefits are being communicated to the consumer. Two physiologically oriented claims (heart disease and osteoporosis) and two psychologically oriented food claims (stress and lack of energy) are expressed in enhanced function format versus disease risk reduction format. Also, it includes the individual difference variable of “regulatory focus” and the health status of the respondent to explore how these factors impact health claim

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<sup>6</sup> This chapter is published as Van Kleef, E., Van Trijp, H.C.M. and Luning, P. (2005b). Functional foods: health claim-food product compatibility and the impact of health claim framing on consumer evaluation. *Appetite*, 44, 299-308.

evaluation. The results show that consumer evaluations primarily differ to the extent that health claims are personally relevant in addressing an experienced disease state. Framing is important, but its effect differs by health benefit. No strong effects for consumers' regulatory focus were found. Underlying mechanisms of these effects and their implications for the development of functional foods are discussed.

#### **4.1 Introduction**

During the last decades, enormous progress has been made in establishing the scientific basis for functional food development in health, nutrition and food processing (Diplock et al., 1999; Mermelstein, 2002). Functional foods are founded on the key premise that, compared to conventional foods, they help to ensure overall good health and/or to prevent/manage specific conditions in a convenient way (i.e. through daily diet) (Sloan, 2000; Poulsen, 1999). Foods with additional health value offer interesting growth opportunities for the food industry. Moreover, there is little question that persuading people to make healthier food choices would provide substantial (public) health effects. Functional foods have become feasible thanks to the enormous progress in the life sciences.

Unfortunately, many functional food products developed from scientific opportunity meet poor market acceptance (Hilliam, 1998; Wennström, 2000). One reason for this poor market performance is that the development and marketing of functional foods differs fundamentally from traditional foods (Heasman and Mellentin, 2001). Even though there is increasing scientific evidence that some food components have beneficial physiological and psychological effects over and above the provision of the basic nutrients, the development of effective persuasive health claims and successful marketing of functional foods has proven to be rather difficult.

In the market place food products that are positioned on a health platform exist in various forms (ranging from content claim to disease risk claims), product categories and communication formats (see e.g. Bradbury, Lobstein and Lund, 1996; Caswell et al., 2003; Parker, 2003). Despite the fact that the content and communication format of health claims are (increasingly) restricted by legal constraints and scientific substantiation requirements, food companies still have several degrees of freedom in terms of (1) which health claims they focus on, (2) through which food product the benefit is being delivered, and (3) the specific way in which the health claim is communicated.

Despite the strategic importance of these three issues, there is surprisingly little scientific research available to support food companies in making these decisions. For example, besides some general rankings of most popular health claims and health concerns (e.g. Young, 2000) little is known about which combinations of health claims and food carriers are most compelling to consumers. Previous research (e.g. Roe, Levy and Derby, 1999; Beck-Larsen and Grunert, 2003) shows that the evaluation of health claims is partly determined by healthiness perceptions of the base product which would suggest that (some) health claims combine better with some food products. Also, the popular statement in food industry seems to be that health claims on foods that emphasize the positive contributions to life (referred to as life marketing in Euromonitor, 2000) are preferable over food claims that emphasize disease

(referred to as death marketing in Euromonitor, 2000) as focal point (see also Coussement, 2000). Yet, framing research in the health area (e.g. Krishnamurthy, Carter and Blair, 2001; Levin, Schneider and Gaeth, 1998) paints a much more complicated picture, suggesting that it depends on contextual (Rothman and Salovey, 1997) and personality factors (e.g. Aaker and Lee, 2001). In other words, this literature is far from consistent suggesting a need for more systematic studies in these areas.

Through two studies, the aim of this paper is to contribute to filling this information gap. Specifically, in a more exploratory context the first study examines the extent to which consumers perceive specific health claims appropriate with particular food products. The second study extends this to examine how consumer responses to health claims are affected by alternative communication formats, namely whether the claim is defined in an enhanced function format versus a disease risk reduction format. The study looks into selective contextual (disease state) and personality (regulatory focus) determinants of health claim perception.

#### **4.2 Study 1: Health claim-food product compatibility**

Previous research (e.g. Jonas and Beckmann, 1998; Poulsen, 1999) has suggested that the acceptance of functional foods depends on the basic product that serves as carrier for the functional ingredient and/or health claim. However, empirical studies regarding the most appropriate carriers for health claims are scarce and the results are mixed. In a study on the healthiness of products as carriers for functional ingredients (rather than health claims), Bech-Larsen and Grunert (2003) provide some insight in the issue. They explored three enrichment conditions (no enrichment condition, omega-3s, and oligosaccharides) for three different products (orange juice, flavoured yoghurt, spread). They found that the two enrichment conditions were seen as less healthy for juice and flavoured yoghurt, but quite healthy for spreads. The authors suggested as explanation that in general spread is perceived as a somewhat unwholesome product which could benefit from nutritional improvement to a larger extent than juice and yoghurt, which are perceived as inherently wholesome already. Their results may indicate that consumers in general find enrichment of 'non-healthy' foods more justified than enrichment of foods, which are perceived as healthy per se. Other studies, however, point in the opposite direction. Balasubramanian and Cole (2002) found that consumers' search for nutrition information in a given food category depends on how they perceive that category. Consumers may ignore nutrition information for fun foods such as candy because these foods meet hedonistic (as opposed to health-related) needs. Cereal bars and other snack products are often seen more as treats and therefore as less serious delivery mechanism. Consumers see products that are intrinsically healthy –such as yoghurt, cereals, bread and juice- as credible carriers of functional messages. For example, Poulsen (1999) found that attitudes towards enrichment were generally more positive when the base product already contains the enriched substance (like calcium in milk). Roe, Levy and Derby (1999) found a similar effect for the perception of healthfulness of functional foods. Prior beliefs about product healthfulness appear to override claim information.

Overall, the research evidence is limited and inconsistent and what is available is based on selective claim-product combinations only. The first study is of an exploratory nature with the purpose to explore food and health claim compatibility more comprehensively and with a broader range of dependent variables. For that purpose, we reanalyzed existing data on ten health claims systematically varied with ten food products. These 100 functional food examples were assessed by consumers on attractiveness, credibility and uniqueness in addition to trial intention.

### ***Methodology***

For the purpose of this study, we reanalyzed data from Van Kleef, Van Trijp, Luning and Jongen (2002), from which insight into claim-product compatibility was not previously reported.

#### *Participants*

Dutch consumer respondents were recruited and selected on the basis that they considered health aspects of foods as an important criterion in their grocery shopping. All respondents had the primary responsibility for grocery shopping in their households. The final sample (n=50) for this exploratory study included 27 females and 23 males with an average age of 35.1 (SD=9.3). Data were collected by a professional market research agency.

#### *Stimuli*

For the purpose of this study, functional foods are defined as concepts consisting of two dimensions: carriers (e.g. food products or pills) and health claims (e.g. 'reduces the risk of heart diseases'). Based on an extensive survey of literature and interviews with experts (i.e. director food market research agency, and two nutritionists), ten instances were selected for the dimensions health claims and carriers (Table 4.1). The set of products was chosen to reflect a diverse set of carriers for health claims. To not narrow down too much, we also included health claims currently not yet legally allowed.

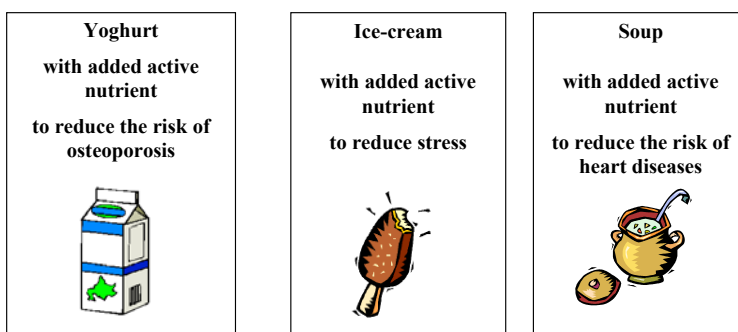
**Table 4.1: Selected health claims and carriers**

Selected health claims	Selected carriers
1. Protects against damage to skin from UV-irradiation	1. Brown bread
2. Gives extra energy	2. Bar of chocolate
3. Helps maintaining healthy cholesterol levels	3. Chewing gum
4. Helps keeping a youthful appearance	4. Margarine
5. Strengthens the natural defence of the body against frequently occurring diseases (like a cold)	5. Meat replacer (like vegetarian burger or stir fry mix)
6. Reduces the risk of certain types of cancer	6. Pills
7. Reduces the risk of osteoporosis	7. Ice-cream
8. Reduces the risk of dementia	8. Soup
9. Reduces the risk of heart diseases	9. Tea
10. Reduces stress	10. Yoghurt

*Procedure*

Systematically varied functional food concepts were offered to respondents as so-called mini-concepts (cf. Durgee, O'Connor and Veryzer, 1998) of two dimensions (carrier × health claim), resulting in a set of 100 health claim-carrier mini-concepts. For example, a mini-concept was described as 'yoghurt, which helps to maintain a youthful appearance'. In this way, a large and diverse set of functional food mini-concepts was obtained, some available in the market place, but most of them were hypothetical concepts (Figure 4.1). Note that we have not systematically varied the functional ingredient to avoid incompatibilities and too technical information. The concepts all indicated only that this involved products 'with an added active ingredient'.

**Figure 4.1: Examples of mini-concepts presented to consumers**



Prior to data collection, a small pre-test was conducted to test the phrasing of the questions and the length of the task. Consumer data collection took place at the central test facility of a Dutch market research agency. Respondents' ratings were given on five-point bipolar agree-disagree scales. All mini-concepts, displayed in verbal and visual format, were randomly presented on a computer screen. The entire task was randomly divided over two sessions, which took place at separate days (to avoid tiredness).

#### *Evaluative measures*

All functional foods mini-concepts were rated on four dependent measures. Respondents were asked to express the extent to which they considered a particular mini-concept as attractive. Credibility was measured by requesting respondents to indicate the degree to which they considered a mini-concept as credible. The uniqueness was measured by asking respondent to what extent they found the mini-concept 'new and different'. Attractiveness, credibility and uniqueness were measured on five-point scales with end-points labeled 'not at all attractive/credible/new and different' to 'very attractive/credible/new and different'. Finally, consumers trial intention was measured by asking 'would you like to try this food product?' on a 5-point scale, anchored by 'absolutely not' and 'absolutely'.

#### *Data analysis*

Consumer perceptions of attractiveness, newness and credibility are regarded as important choice criteria underlying 'intention to try'. Through regression analysis it was determined how the three variables contribute to consumers' intention to try the mini-concept. The reported standardized regression coefficients allow for a direct comparison between coefficients concerning their relative explanatory power of the dependent variable. In addition, correlations were used to assess the association between the variables. Analysis of variance was applied to respondent's ratings to calculate the main effects of health claim and carrier, and also the interaction between health claim and carrier. Student-Newman-Keuls multiple range tests were applied to examine differences between means.

### **Results**

#### *Determinants of consumers' intention to try functional foods*

The regression analysis revealed that consumers' intention to try a functional food is driven by its attractiveness ( $\beta = 0.67$ ,  $p < 0.001$ ), credibility ( $\beta = 0.21$ ,  $p < 0.001$ ), and uniqueness ( $\beta = 0.11$ ,  $p < 0.001$ ). Together these three explanatory variables account for 66 per cent of the variation in 'intention to try'. Bivariate correlations with 'intention to try' confirm that attractiveness drives intention to try ( $r = 0.79$ ,  $p < 0.01$ ) with smaller contributions for credibility ( $r = 0.52$ ,  $p < 0.01$ ) and uniqueness ( $r = 0.24$ ,  $p < 0.01$ ). Interestingly, the credibility of a



functional food concept correlates negatively with its uniqueness ( $r = -0.11$ ,  $p < 0.01$ ), suggesting that consumers tend to evaluate new concepts as less credible.

Analysis of Variance (ANOVA) for each of the four consumer measures as dependent variables revealed that the main effects of health claim and carrier are significant on all four consumer measures (Table 4.2). For 'intention to try' the health claim is the main driver, while perceptions of 'uniqueness' are driven primarily by the carrier to which the health claim is attached. Perceptions of intention to try and attractiveness follow a main effects model without interactions between the health claim and the carrier. Small, but statistically significant two-way interactions were found for 'credibility' and 'uniqueness', which indicates that certain combinations of health claims and carriers were evaluated as more/less credible and unique than would be expected from the separate health claim and carrier evaluations<sup>1</sup>.

**Table 4.2: Results ANOVA for 'intention to try', 'attractiveness', 'credibility', and 'uniqueness'**

	Intercept	Health Claim	Carrier	Health Claim* Carrier
Intention to try	805.0*	26.5*	6.1*	0.9 (NS)
Attractiveness	1060.1*	16.9*	12.3*	0.9 (NS)
Credibility	168.8*	30.9*	16.7*	2.9*
Uniqueness	1752.2*	4.3*	11.7*	1.6**
	* p < 0.001	** p < 0.05		

Given the absence of significant interactions between health claims and carriers, Table 4.3 reports the means and standard deviations for 'attractiveness' and 'intention to try' separately, together with the Student-Newman Keuls multiple comparisons tests. Health claims relating to disease conditions (e.g. heart disease, cancer, cholesterol, osteoporosis) were rated as more attractive than the more psychologically (stress, dementia) and appearance-related (youthfulness, skin protection) benefits. The delivery of extra energy and natural defence are also well received by consumers both in terms of attractiveness and intention to try. Margarine and yoghurt feature as attractive carriers for functional foods, much more so than the indulgence-type products such as chewing gum, ice cream and chocolate. Meat replacers are received very poorly as functional food carrier.

**Table 4.3: Attractiveness and intention to try of 10 health claims and 10 carriers measured as part of mini-concept (mean and standard deviation)**

	<i>Mean ratings (sd)</i>	
	attractiveness	intention to try
<b>Health claims</b>		
Reduces the risk of heart diseases	3.47 (1.39) <i>a</i>	3.29 (1.41) <i>a</i>
Reduces the risk of certain types of cancer	3.44 (1.41) <i>a</i>	3.13 (1.44) <i>a</i>
Helps maintaining healthy cholesterol levels	3.43 (1.36) <i>a</i>	3.34 (1.39) <i>a</i>
Gives extra energy	3.38 (1.40) <i>a</i>	3.29 (1.43) <i>a</i>
Reduces the risk of osteoporosis	3.36 (1.36) <i>a</i>	3.22 (1.43) <i>a</i>
Strengthens the natural defence of the body against frequently occurring diseases (like a cold)	3.33 (1.42) <i>a</i>	3.25 (1.43) <i>a</i>
Reduces stress	3.14 (1.47) <i>b</i>	2.94 (1.43) <i>b</i>
Reduces the risk of dementia	2.96 (1.40) <i>c</i>	2.60 (1.40) <i>c</i>
Helps keeping a youthful appearance	2.91 (1.42) <i>c</i>	2.55 (1.49) <i>c</i>
Protects against damage to skin from UV-irradiation	2.84 (1.46) <i>c</i>	2.70 (1.48) <i>c</i>
<b>Carriers</b>		
Yoghurt	3.59 (1.33) <i>a</i>	3.33 (1.39) <i>a</i>
Margarine	3.48 (1.35) <i>a,b</i>	3.15 (1.43) <i>a,b</i>
Brown bread	3.34 (1.38) <i>b,c</i>	3.14 (1.44) <i>a,b</i>
Pills	3.33 (1.44) <i>b,c</i>	2.96 (1.40) <i>b,c</i>
Tea	3.25 (1.43) <i>c,d</i>	3.08 (1.44) <i>b,c</i>
Bar of chocolate	3.15 (1.44) <i>c,d,e</i>	3.00 (1.50) <i>b,c</i>
Soup	3.08 (1.41) <i>d,e</i>	2.98 (1.43) <i>b,c</i>
Ice-cream	3.05 (1.50) <i>d,e</i>	2.94 (1.55) <i>b,c</i>
Chewing gum	3.04 (1.49) <i>d,e</i>	2.91 (1.53) <i>b,c</i>
Meat replacer	2.96 (1.38) <i>e</i>	2.82 (1.43) <i>a</i>

*a,b,c,d,e mean values sharing the same letter within a column are not significantly different (p=0.05)*

## Discussion

Despite its exploratory nature, this study has yielded two important insights into the market of functional food positioning. *First*, consumers' willingness to try a functional food is driven by more than its attractiveness. The perception of the credibility of the functional food also significantly enhances the intention to purchase. Likewise, the uniqueness of the functional food increases the intention to purchase, although to a lesser extent.

*Second*, the lack of significant interaction between health claim and carrier for attractiveness and trial intention indicates that in their value perceptions of functional foods consumers consider the contributions of health claims and carriers independently from each other. This suggests substantial flexibility in functional food design in that popular health claims can be applied to several (popular) food products. It is not so that the attractiveness of certain health benefits depends on the carrier to which the claim is applied. Popular health claims are those that address relevant disease states which is in accordance with results of previous studies showing important health concerns of consumers or top rankings of health

claims in different countries (Hilliam, 1998; Sloan, 2000). To some extent these findings may reflect familiarity with what is available in the market place, but the presence of cancer as desirable health benefit (not currently marketed) suggests that findings extend beyond sheer familiarity. However, it is important to note that although there is an increasing interest in functional foods, which influence appetite, satiety, vitality, stress and other states of mood and well-being (Verschuren, 2002), not many products are yet available in the Dutch market.

Highly ranked carriers include yoghurt, margarine, brown bread and pills. The convenience aspects of these products may be particularly important for consumers, since the first three carriers are often substantive part of the daily diet (Baltas, 2001). Pills are also highly valued carriers for health claims, probably because of the medical and curative associations consumers have with this carrier. Again, this finding may reflect availability in the market place as yoghurt, margarine and supplements feature well in the functional food supply (Hilliam, 2000; Menrad, 2003). Although carriers and health claims contribute independently to perceived attractiveness and intention to try, perceptions of credibility and (to lesser extent) uniqueness are dependent on the specific claim-carrier combination. For credibility this is in line with Poulsen (1999), who reported similar findings.

Overall, this study has identified that consumers tend to prefer functional food concepts, which primarily communicate disease-related health benefits in carriers that have an image or history in healthiness. However, this exploratory study has a number of limitations that prevent us from: (1) exploring the differences as to how the claim is being communicated, as these were not systematically varied in study 1, and (2) the effect of relevant individual difference factors in claim perception, as the exploratory sample was too small to allow such analyses. These two issues will be explored in study 2 with larger sample size and systematic variation in whether the claims are communicated in terms of a gain for the consumer (i.e. enhance function format) versus the reduction of loss (i.e. disease risk reduction format).

### **4.3 Study 2: The impact of health claim framing on consumer evaluation**

Study 1 explored health claim perceptions across systematically varied combinations of claimed benefits and carrier types. Study 2 focuses more in depth on one of these carriers (yoghurt) and systematically varies the way in which specific health benefits are being communicated to the consumer. Specifically, two more physiologically oriented claims (related to heart disease and osteoporosis) and two more psychologically oriented food claims (stress and lack of energy) are expressed in enhance function format as well as disease risk reduction format. Also, it includes the individual difference variable of “regulatory focus” (e.g. Higgins, 1997) that has recently received considerable attention in the health framing literature (e.g. Shiloh, Eini, Ben-Neria and Sagi, 2001; Lee and Aaker, 2004). Finally, we include the health status of the respondent to explore how this contextual variable affects perceptions of health claims.

This design allows us to explore three important research questions with respect to the framing of health claims. First, are enhanced function claims indeed more appealing than disease risk reduction health claims, as the popular belief in food industry seems to be?

Second, does this preference change on the basis of personal relevance of the health claim (e.g. Maheswaran and Meyers-Levy, 1990) in that reduced disease risk claims are more appealing when they relate to health problems that one is actually experiencing him/herself? Third, does an individual's regulating motivational system impact on the evaluation of health claims?

### ***Theoretical background and hypotheses***

The extent to which consumers find health claims appealing depends on a number of factors, including the content and format of the message (Mazis and Raymond, 1997). For legislative purposes, a distinction is made between 'enhanced function' health claims and 'reduced disease risk' health claims (Ovesen, 1999; Diplock et al., 1999). 'Enhanced function' claims relate to the consumption of a food or food component that contributes beneficially to health (e.g. 'improves cognitive performance'). 'Reduced disease risk' claims relate to the consumption of a food or food component that helps to reduce the risk of a specific disease or otherwise undesirable health condition (e.g. 'reduces risk on heart diseases'). As such, health claims may be formulated to focus attention on its potential to provide a benefit or gain or on its potential to prevent or avoid a loss. Both frames should enhance the evaluation of the issue, but the question is which type of goal has the greater persuasive impact. The most common finding in literature is that, in the context of attribute framing, people respond more favourably to positive than negative framing (Levin, Schneider and Gaeth, 1998; Krishnamurthy, Carter, and Blair, 2001). Hence, we expect that enhanced function claims are more appealing to consumers, because they evoke positive associations from memory, which make them being rated more positively by consumers. Reduced disease risk claims activate negative information in memory. Although they provide consumers with the opportunity to maintain their present healthy status, they confront consumers with illnesses and problems they might fall victim to, which makes them less appealing. Hence, in line with the popular belief in food industry, we expect that enhanced function health claims will have a greater persuasive impact than reduced disease risk claims:

H1      Enhanced function claims are more appealing to consumers than reduced disease risk claims

#### *Personal illness*

Although we expect that on average consumers find enhanced function claims more appealing, it has been found that consumers look at health claims differently when a change occurs in their health status. Personal experience with a health issue makes people more aware and involved and hence influences one's receptiveness to information addressing those relevant health issues. For example, a family history of cancer may lead people to be more susceptible for health claims relating to cancer. In general, the more involved people are, the more motivated they are to pay attention to messages and spend more cognitive effort processing the message (Petty and Cacioppo, 1981). When people feel vulnerable, they tend to process health information more carefully. In contrast, individuals without health problems

typically engage in defensive tendencies to avoid health messages. Block and Keller (1995) found that when individuals process information in-depth, negative frames are more persuasive than positive frames. Similarly, Maheswaran and Meyers-Levy (1990) found that negative information is more effective than positive information when people thoroughly evaluate the information. Hence, we expect that consumers who evaluate a personally relevant health claim, they are more likely to prefer reduced disease risk claims.

H2 Reduced disease risk claims are more appealing to consumers than enhanced function claims when the health claim involves a personal relevant illness

### *Regulatory focus*

The regulatory focus theory (Higgins, 1997) distinguishes between two most important categories of desired goals that individuals strive to achieve: those that relate to achieving a desired end-state (termed promotion goals) and those that relate to avoiding an undesired end state (termed prevention goals). According to the regulatory focus theory, promotion versus prevention focus are fairly stable personality characteristics although to some extent under the control of contextual requirements (i.e. state properties). Individuals with a promotion focus will quite consistently regulate their behaviours towards positive outcomes and those with a prevention focus will regulate their behaviours away from negative outcomes. The predominant focus of an individual in life impacts on the emotions experienced, perceptions of value and more (Higgins, 2000). Differences in the predominant focus of individuals are generally caused by differences in upbringing (Higgins, 1989). Importantly, Higgins and colleagues (e.g. 2003) found that people are especially sensitive to information that is consistent with their dominant regulatory focus. When people pursue goals in a strategic way that conform to their regulatory focus, they feel right about what they are doing. This experience of correctness and importance is transferred to the subsequent evaluation of a particular object, thereby increasing its perceived value (Camacho, Higgins and Luger, 2003; Higgins et al., 2003). Enhanced function claims emphasize the gain to be obtained, while reduced disease risk claims emphasize the prevention of pain. This would imply that people with a predominant promotion focus should prefer enhanced function-framed health claims and people with a predominant prevention focus should prefer reduced disease risk-framed health claims. Hence,

H3A Enhanced function claims will be more appealing to persons with a predominant promotion focus

H3B Reduced disease risk claims will be more appealing to persons with a predominant prevention focus

## Methodology

### Participants

The study was conducted among 124 adults (42 male, 82 female). As people age, they are more likely to experience health problems themselves or someone in their close environment (one of our independent variables). Participants were recruited through choral groups to ensure sufficient representation of older participants. Participants aged 27-80 years with an average of 48.9 years (SD = 10.2).

### Experimental design

The overall design of this study was a two (frame type: enhanced function versus reduced disease risk) by four (type of health benefit: cardiovascular diseases, osteoporosis, stress, fatigue) mixed design. Two physiologically-based diseases (cardiovascular disease and osteoporosis) and two psychologically-based health problems (stress and fatigue) are included. Each health benefit was expressed in an enhanced function and reduced disease risk frame (Table 4.4). Each participant responded to four of these hypothetical health claims: one health claim frame for each health benefit, in total two enhanced function-framed health claims and two reduced disease risk-framed health claims. To make the evaluation task more realistic for consumers, all health claims were tested in the context of yoghurt as an appropriate (see study 1) base product stimulus. Also, to enhance realism all functional food product concepts were presented with a hypothetical brand name which was systematically varied across research conditions. As brand name did not affect consumer evaluations, it is therefore not discussed any further. In Table 4.4, the brand name variable is reported as Product name<sup>®</sup>.

**Table 4.4: This study's health claims framed as enhanced function or reduced disease risk health claim**

<i>Health problem</i>	<i>Enhanced function health claims</i>	<i>Reduced disease risk health claims</i>
Heart diseases	<i>Product name<sup>®</sup>, strengthens your heart. Drink product name<sup>®</sup>, and get a healthier heart-function!</i>	<i>Product name<sup>®</sup>, lowers the risk of cardiovascular diseases. Drink product name<sup>®</sup>, and prevent clogged arteries!</i>
Osteoporosis	<i>Product name<sup>®</sup>, strengthens your bones. Drink product name<sup>®</sup>, and get extra strong bones!</i>	<i>Product name<sup>®</sup>, lowers the risk of osteoporosis. Drink product name<sup>®</sup>, and prevent frail bones!</i>
Stress	<i>Product name<sup>®</sup>, brings you body in a total relaxed state. Drink product name<sup>®</sup>, relax and afterwards you can live your life to the fullest!</i>	<i>Product name<sup>®</sup>, helps to prevent the negative consequences of stress. Drink product name<sup>®</sup>, prevent restlessness!</i>
Lack of energy	<i>Product name<sup>®</sup>, increases your energy level. Drink product name<sup>®</sup>, and get more from life!</i>	<i>Product name<sup>®</sup>, helps to prevent fatigue. Drink product name<sup>®</sup>, and prevent listlessness!</i>

### *Evaluative measures*

Participants were asked to rate the extent to which they found the yoghurt concept attractive, convincing and credible. All three items were assessed on 7-point scales with end-points labelled 'absolutely not attractive/convincing/credible' and 'absolutely attractive/convincing/credible'. Similarly, one item assessed participant's intention to buy the product by asking the question 'Can you imagine yourself buying his drink?' to be answered on a 7-point scale with end-points labelled 'absolutely not' to 'absolutely'.

### *Measurement predominant focus*

Respondents' dominant focus was measured through a shortened version of the Lockwood, Jordan and Kunda (2002) scale. To reduce the burden for respondents, 6 items were selected from both the promotion and prevention subscales (Table 4.5). Respondents indicated the extent to which they endorse items relevant to promotion goals (e.g., 'I frequently imagine how I will achieve my hopes and aspirations'; 'Overall, I am more oriented toward achieving success than preventing failure') and items relevant to prevention goals (e.g., 'In general, I am focused on preventing negative events in my life'; 'I am anxious that I will fall short of my responsibilities and obligation'). All items were rated on the extent to which they reflected the participants own behaviour on a 7-point scale with end-points labelled 1 (fully disagree) and 7 (fully agree). Factor analysis with varimax rotation was applied to confirm the two dimensional structure of the scale. As table 4.5 shows items loaded properly on the subscales and both subscales exhibited adequate (Nunnally, 1978) internal reliability (i.e. Cronbach's alpha 0.70 and above).

**Table 4.5: Factor loading pattern (after varimax rotation) and internal reliability for prevention and promotion subscales**

	Factor loadings		Cronbach's alpha
	Factor 1	Factor 2	
Predominant promotion focus			0.75
• I frequently imagine how I will achieve my hopes and aspirations	0.680	0.248	
• I typically focus on the success that I hope to achieve in the future	0.679	0.154	
• I see myself as someone who is primarily striving to reach my 'ideal self'- to fulfil my hopes, wishes, and aspirations	0.768	0.061	
• In general, I am focused on achieving positive outcomes in my life	0.558	-0.152	
• I often imagine myself experiencing good things that I hope will happen to me	0.615	0.261	
• Overall, I am more oriented toward achieving success than preventing failure	0.640	-0.269	
Predominant prevention focus			0.70
• In general, I am focused on preventing negative events in my life	0.157	0.536	
• I am anxious that I will fall short of my responsibilities and obligations	-0.038	0.631	
• I see myself as someone who is primarily striving to become the self I 'ought' to be - fulfil my duties, responsibilities, and obligations	0.202	0.616	
• I frequently think about how I can prevent failures in my life	0.273	0.722	
• I often imagine myself experiencing bad things that I fear might happen to me	-0.068	0.707	
• I am more oriented toward preventing losses than I am toward achieving gains	-0.190	0.531	

Regardless of the strength of each participant's promotion and prevention goals, it is important to determine the relative strength of each participant's promotion and prevention goals. The relative strength may determine which regulatory concerns will gain salience and drive behavior (Lockwood, Jordon and Kunda, 2002). In accordance to Lockwood, Jordon and Kunda, predominant regulatory focus was determined by subtracting scores on the prevention goal subscale from scores on the promotion goal subscale. Scores higher than zero on this measure reflect relatively greater promotion than prevention focus. On average, promotion goal strength (mean=4.21, SD=0.92) was greater ( $t=5.9$ ;  $p<0.01$ ) than prevention goal strengths (mean=3.58; SD=0.97). Scores equal to zero on this measure were removed from analysis (4 respondents). As a result, 72% of the respondents were classified as predominantly promotion focused and 28% of the respondents as predominantly prevention focused.

*Measurement of personal illness*

At the end of the questionnaire respondents were asked whether they or someone in their close environment suffer from lack of energy, osteoporosis, stress or heart diseases. A dummy



variable was created indicating whether the respondent's health claim rating concerned a personal relevant illness or not. Of all respondents, 42% indicated that they or someone in their close environment suffered from lack of energy. For stress, heart diseases and osteoporosis, percentages were respectively 37%, 24% and 19% respectively.

#### *Data analysis*

Analysis of Variance was applied to the four consumer evaluation measures separately: (1) convincing, (2) attractive, (3) credible, and (4) buying intention, with both the main effects and the two- and three-way interactions included.

#### **Results**

Table 4.6 shows the results from the analysis of variance for each of the included factors (benefit type of claim, framing claim, dominant focus respondent and relevant illness of respondent). Results in this table reveal that the largest contributions come from the main effects of benefit type and whether or not a health claim relates to a personally relevant health problem and to lesser extent from the benefit x framing interaction. The type of benefit being claimed has a strong effect on all four consumer measures (all  $F_s(1,123) > 4.96$ ,  $p < 0.01$ ). The osteoporosis health claim has the highest mean ratings on all consumer measures (ranging from  $M=3.56$  ( $SD=1.90$ ) for purchase intention to  $M=4.00$  ( $SD=1.61$ ) for convincing). This may reflect the fact that the sample was composed of somewhat older respondents.

**Table 4.6: Analysis of Variance of evaluative measures on key factors**

<i>(df in brackets)</i>	Attractiveness		Credible		Convincing		Willingness to buy	
	F	p	F	p	F	p	F	p
<b>Main effects</b>								
Benefit type of claim	4.96	0.002	10.18	<0.001	9.65	<0.001	9.38	<0.001
Framing claim	0.02	0.883	2.46	0.117	0.24	0.623	3.84	0.051
Dominant focus respondent	0.006	0.936	3.27	0.071	1.24	0.266	1.00	0.319
Relevant illness	12.68	<0.001	2.48	0.116	11.07	0.001	11.81	0.001
<b>Two-way interaction effects</b>								
Benefit type * framing claim	2.59	0.052	4.89	0.002	3.40	0.018	4.09	0.007
Benefit type * dominant focus respondent	0.30	0.824	1.04	0.410	0.36	0.783	0.20	0.895
Benefit type * relevant illness	0.27	0.849	0.31	0.821	0.31	0.819	0.20	0.895
Framing claim * dominant focus respondent	0.08	0.773	0.85	0.357	0.37	0.545	1.64	0.201
Framing claim * relevant illness	0.22	0.643	0.03	0.860	0.08	0.781	0.68	0.409
Dominant focus respondent * relevant illness	3.54	0.061	0.13	0.718	2.30	0.130	1.02	0.314
<b>Three-way interaction effects</b>								
Benefit type * framing claim * dominant focus respondent	1.12	0.342	0.76	0.519	2.07	0.104	2.06	0.104
Benefit type * framing claim * relevant illness	0.92	0.429	1.60	0.189	3.31	0.020	1.24	0.295
Benefit type * dominant focus respondent * relevant illness	0.33	0.802	1.02	0.384	0.79	0.503	0.49	0.690
Framing claim * dominant focus respondent * relevant illness	0.24	0.627	0.00	0.997	0.12	0.726	0.56	0.456

### *H1: Reduced disease risk claim versus enhanced function claims*

Contrary to hypothesis 1, it was found that overall reduced disease risk-framed health claims have significantly higher purchase intention ratings than enhanced function-framed health claims ( $F(1,123)=3.84, p=0.05$ ). The main effect of health claim framing was not significant for attractiveness ( $F(1,123)=0.02, p=0.88$ ), credibility ( $F(1,123)=2.46, p=0.12$ ) and convincing ( $F(1,123)=0.24, p=0.62$ ). Rather, the impact of framing depended on the health benefit described in the claim (all  $F_s(1,123)>2.59, p\leq 0.05$ ). An examination of the means of the separate benefit types reveals that reduced disease risk-framed *cardiovascular disease* claims were rated higher on all consumer measures than enhanced function-framed cardiovascular disease claims ( $p<0.05$ ), whereas reduced disease risk-framed energy claims were rated lower on all consumer measures than enhanced function-framed energy claims ( $p<0.05$ ).

### *H2: Personal relevant illness*

Overall, health claims relating to a personally relevant illness were considered more attractive ( $F(1,123)=12.68, p<0.001$ ) and convincing ( $F(1,123)=11.07, p<0.001$ ) and had higher purchase intention ratings ( $F(1,123)=11.81, p<0.001$ ) compared to health claims not relating to a personally relevant illness. Contrary to hypothesis 2 regarding framing and personal relevancy of evaluated health claims, reduced disease risk claims were not rated higher than enhanced function health claims when the evaluation involved a personal relevant illness (all  $F_s(1,123)<0.68, NS$ ). However, the three-way interaction between benefit type, framing claim and relevant illness was significant for convincing ( $F(1,123)=3.31, p=0.02$ ). In case a health problem was considered to be personally relevant, a reduced disease risk frame relating to stress and cardiovascular disease was more convincing than an enhanced function frame, whereas lack of energy was more convincing in an enhanced function frame compared to reduced disease risk frame.

### *H3: Predominant focus measurement*

Overall, individuals with a predominant promotion focus give higher ratings when evaluating health claims, although this difference is only (marginally) significant for 'credible' ( $F(1,123)=3.27, p=0.07$ ). In contrast to hypothesis 3, a health claim is not more appealing when it matches the regulatory focus of respondents (all  $F_s(1,123)<1.64, NS$ ). For cardiovascular diseases, the reduced disease risk frame is more appealing, regardless of predominant focus of respondent. An exception is the health claim relating to stress. Although both frames are in general equally assessed, predominant prevention focused participants shift their preference to the reduced disease risk frame. The opposite effect, however, occurs for lack of energy. Here respondents find enhanced function framed claims more appealing even though their predominant focus is prevention.

## ***Discussion***

Study 2 aimed to extend study 1 to include alternative framing formats and a selection of relevant individual difference variables. Health claim perceptions primarily differ to the extent that they are personally relevant to the consumer in addressing an experienced disease state. In line with study 1 physiology based benefits are considered more attractive, credible, convincing and compelling to induce trial, and particularly so for osteoporosis. Framing is important, but its effect differs by health benefit to the extent that disease risk reduction framing is considered more attractive for heart diseases while enhanced function formats are preferred for low energy levels. We find no strong effects for consumers' regulatory focus. Promotion focused consumers do not respond more positively to enhanced function claims as suggested by one of our hypotheses.

### **4.4 General discussion and conclusion**

In the context of functional foods, this study was motivated by the need to strengthen the scientific underpinning of the managerial decisions as to (1) which health benefit to claim, (2) with which product category and (3) in which communication format. It also explored selective individual difference variables. Overall, (see also discussion sections on the two studies) our results suggest that physiology-based health benefits (e.g. heart health, osteoporosis, cancer) are preferred over the "softer" psychology/behaviour based benefits (e.g. stress, lack of energy, appearance). This may be contradicting common belief in food industry, but is generally in line with the health framing literature (Levin, Schneider and Gaeth, 1998) stating that negative information is more informative, attracts more attention and stimulates deeper information processing than positive information. Our finding that claims are best received when attached to products with a positive health image and health claim history (such as yoghurt and margarine) are most likely due to existing marketing activity in these areas. These product categories have invested lots of marketing effort in functional food development and communication and this seems to pay off. Other product categories have a longer way to go in educating consumers that they can be functional food platforms.

We do not find evidence for the hypothesized superiority of enhanced function claims over disease risk reduction claim formats. The preferred framing depends on the type of benefit being claimed. Enhanced function claims are preferred for energy levels whereas reduced risk reduction formats are preferred for heart disease. Also, we don't find evidence that promotion focused respondents prefer enhanced function claims in general. Again, this depends on the benefit being claimed. This finding contradicts findings reported by Aaker and Lee (2001) and Lee and Aaker (2004), but this may be due to the fact that we have exploited more realistic claim formulations than they used in their studies.

In sum, this study has progressed the understanding of consumers' health claims perceptions in several areas, but not supported our theoretical expectations in other areas. More scientific work is certainly justified within this strategically important yet poorly

understood area. Such future studies should address some of the limitations inherent in this study, such as relatively small and selective samples. Extensions to other target groups may further refine these insights. Further extensions may include other individual difference measures beyond regulatory focus and personal illness as determinants of health claim perceptions. Finally, regulatory focus may be a concept worth exploring further in the food choice behaviour area, which may result in a food-specific application of this relevant individual difference characteristic.



# Chapter 5

## Reconciling through preferences or perceptions: internal versus external preference analysis<sup>7</sup>

### Abstract

The present study aimed at providing a comprehensive conceptual and empirical comparison of internal and external preference analysis by critically comparing them on a set of statistical criteria and usefulness of product maps for end-users. Overall, the conclusion of this study is that both internal and external preference analysis emphasise fundamentally different, but complementary perspectives on the data. Internal preference analysis accounts better for consumer preferences and hence captures 'consumer understanding' while external preference analysis accounts better for perceptual or sensory information and hence captures 'product understanding'. In addition, external preference analysis shows stronger stability against the specific included selection of products in the study. The results further revealed that end-users find information from external analysis more actionable for food technological tasks. Internal preference analysis holds a clear advantage on marketing actionability and new product creativity. No preference technique holds a clear advantage on marketing-R&D interface appropriateness and comprehensibility. Rather than recommending applying both techniques, we suggest several ways forward in better exploiting the synergy between these two approaches.

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<sup>7</sup> Part of this chapter is published as Van Kleef, E., Van Trijp, H.C.M. and Luning, P. Internal versus external preference analysis: an exploratory study on end-user evaluation. *Food Quality and Preference* (in press)

## 5.1 Introduction

Understanding market needs in order to design products that meet or exceed consumer expectations is one of the most critical tasks for developers of new products. In the last decade, the importance of listening carefully to the 'voice of the consumer' has become conventional wisdom (Slater and Narver, 2000; Garber, Hyatt and Starr, 2003). Over the years, many tools and techniques have been developed for use in the new product development process. Better and effective use of consumer intelligence obtained by appropriate methodologies is viewed as critical to being successful (Cooper, 1993; Calantone, Schmidt and Song, 1996). Preference mapping techniques belong to the most popular tools of marketing research (Cooper, 1983; Urban and Hauser, 1993). Besides their application to a wide range of marketing problems, they are frequently used for the purpose of product development (e.g. Kaul and Rao, 1995; Arditti, 1997; McEwan, Earthy and Ducher, 1998; Jaeger, Rossiter, Wismer and Harker, 2003). The reason for this is that although consumers can be clear about which products they like and dislike, they are not always able to describe specifically why they like or dislike a product. Preference analysis techniques are able to relate external information about the products to consumer preference ratings in order to understand what attributes of a product are driving preferences.

There are two basic approaches to the analysis and understanding of consumer preferences. These are generally referred to as *internal* and *external* preference analysis. Although they are based on using the same data, internal and external preference analysis represent different perspectives on this data and hence extract different information from it. External preference analysis requires both perceptual and preference data whereas internal preference analysis can in principle be conducted on preference data alone. However, in internal preference analysis it is possible and in fact common to fit perceptual data in the product map for interpretation (e.g. Richardson-Harman et al., 2000; Martínez, Santa Cruz, Hough and Vega, 2002), sometimes referred to as extended internal preference mapping (McEwan, Earthy and Ducher, 1998). It is then just the other way around in comparison with external preference analysis where the product map is made with perceptual (e.g. sensory) data and where in addition the preference data are fitted in this map.

Internal and external preference analyses are typically applied for the same purpose - namely, to look for underlying dimensions, believed to drive consumer choices. The decision to initially map preference or perceptual data, however, is not arbitrary. Internal and external preference analyses do not only provide a different perspective on the same data; the choice for one or the other technique has a 'philosophical' component to it. It closely relates to the long and controversial debate in consumer behaviour literature as to whether perception or preference would deserve primacy in consumer understanding. Early research in consumer decision-making assumed that differences in preferences are related to differences in perceived product attributes (e.g. Brunswick, 1952; Lancaster, 1971). Behavioural research soon demonstrated that this theory was limited in its ability to describe many phenomena (Medin, Goldstone and Markman, 1995). Empirical analyses into the nature of differences between similarity and preference judgments showed that the underlying dimensions of these judgements differ (Derbaix and Sjöberg, 1994; Creusen and Schoormans, 1997). Likewise,



Zajonc (1980) argued that affective reactions such as giving a preference judgement, usually, if not always, precede cognitive processes of detecting (dis)similarities in product attributes. Later on, individuals may justify or further reflect on the preferred choices.

Moreover, the choice for either technique is not arbitrary because end-users typically rely on the insights the resulting maps provide for the actions the user has to take. In particular, it is a receiver's perception of the usefulness of provided market information which determines whether he or she acts on it (e.g. Menon and Varadarajan, 1992; Ottom and Moore, 1997; Hart, Tzokas, and Saren, 1999.) Accordingly, Wind and Mahajan (1997) argue in their influential paper about the future of research in new product development that any evaluation of methods should include the user's perception of its value. Considering the controversy in giving primacy to preferences or perceptions, it is surprising that there have been relatively few conceptual and methodological comparisons between internal and external preference analysis. Unfortunately, both internal and external preference analysis are typically evaluated on the basis of solely statistical criteria, irrespective of the individuals who ultimately use them. However, building strategic decisions on one approach rather than the other presuppose good knowledge of their strengths and weaknesses. Hence, the purpose of the present study is to identify the relative strengths and weaknesses of the two approaches by critically comparing them on a set of criteria. More specifically, important criteria for comparison arise from the techniques' ability to account for information (i.e. statistical content). In addition, one of the primary contributions of this study is the conceptualisation and measurement of the extent to which their users perceive the methods as useful in terms of actionability for food technological, marketing and creative purposes. Insight into the relative performance of internal and external preference analysis on these criteria provides important information on the value of the techniques and would assist the product developer in the selection of the most appropriate procedure.

## **5.2 Theoretical background and hypotheses**

### ***Preference analysis***

Preference analysis is a generic term given to techniques that quantify, analyse and interpret consumer preferences for products. At first, internal preference analysis was developed consisting of an ideal point unfolding model by Coombs (1964) and a vector model developed by Tucker (1960). Later on, the labels 'internal' and 'external' analyses of preference data were first suggested by Carroll (1972). Internal preference analysis gives precedence to consumer preferences and uses perceptual information as a complementary source of information. External analysis, on the other hand, gives priority to perceptual information by building the product map based on attribute ratings and only fits consumer preferences at a later stage. Table 5.1 presents an overview of these basic differences between internal and external preference analysis.

**Table 5.1: Overview of basic differences between internal and external preference analysis**

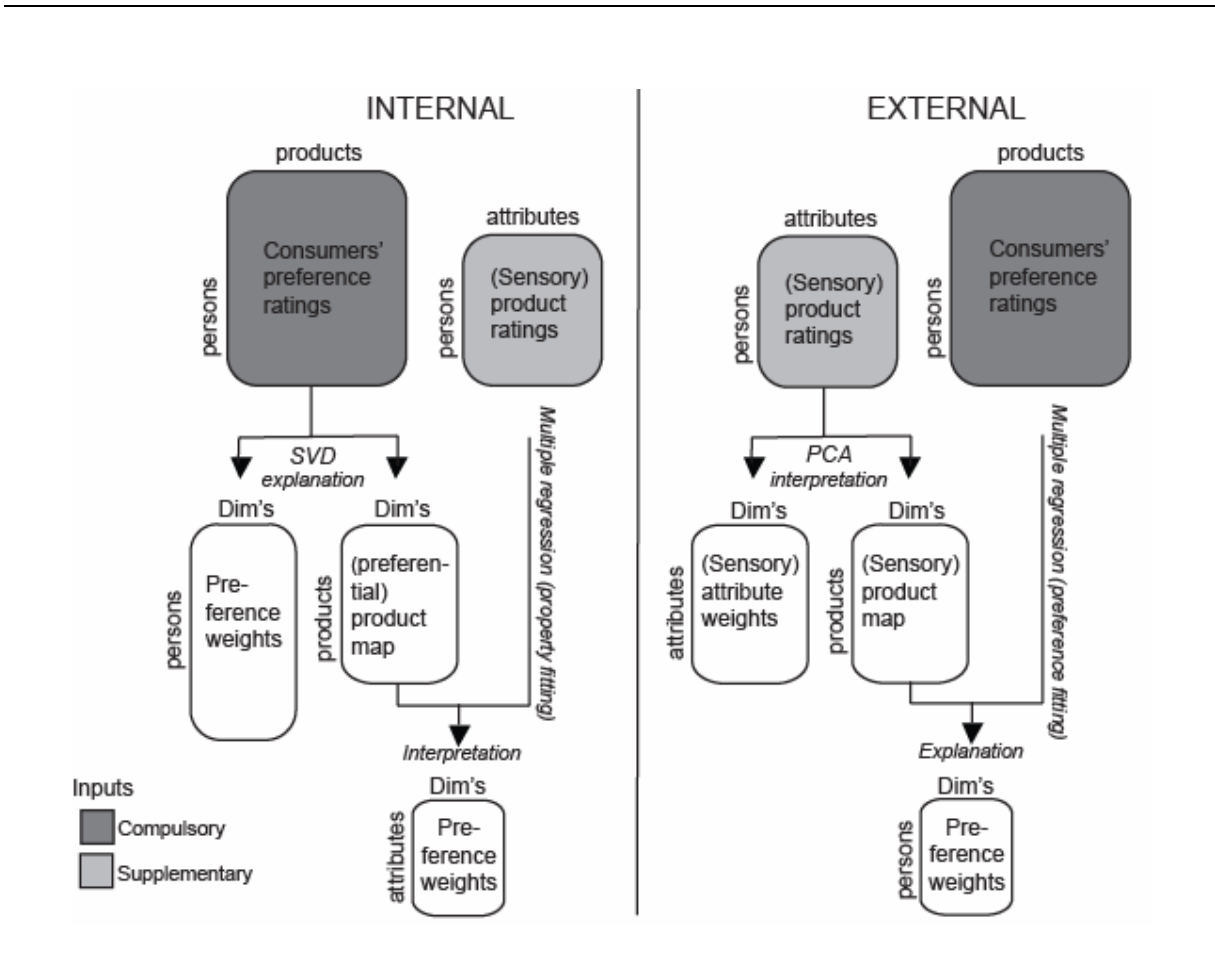
	Internal preference analysis	External preference analysis
<b>Primacy of:</b>	preference	perception
<b>Product positions in map:</b>	account for variation in preference/liking data	account for variation in perceptual/similarity data (often sensory data)
<b>First dimension:</b>	explains maximum variability in preference directions between product stimuli	explains maximum variability in perceptual (e.g. sensory) directions between product stimuli
<b>Preference data:</b>	drive orientation of the product space	is supplementary: fitted into 'fixed' perceptual product space
<b>Perceptual data:</b>	is supplementary: fitted into 'fixed' preferential product space	drive orientation of the product space

In figure 5.1 both statistical procedures of internal and external preference analysis are visualised on the basis of data matrices. The term 'explanation' in figure 5.1 is used to mark the step in which the respondents' preferences are coupled to products and the term 'interpretation' is used to mark the step in which dimensions are interpreted. Internal preference analysis can be considered as a variant of principal component analysis. It takes individual consumers' preference ratings for a number of products as key input and uses the mathematical procedure of Singular Value Composition (SVD) to decompose this matrix of preferences into its 'basic structure' (Green and Carroll, 1976), which consists of two matrices: (1) a ('preferential') product map where the products are positioned in a lower dimensional products space (i.e. products X dimensions), and (2) individual consumers' preference weights along the dimensions of the product map (i.e. consumers X dimensions). Sensory product ratings (i.e. products X attributes) are subsequently fitted into the product map to facilitate interpretations of the individual dimensions. External preference analysis essentially takes the same data, but in a different order. First, it takes experts' or consumers' perceptual (e.g. sensory or physical information about products) product ratings (products X attributes) as input (sufficient products and sufficient (sensory) attributes)<sup>8</sup>. Next, the statistical procedure of Principal Components Analysis (PCA) is used to decompose this matrix of perceptions into its basic structure which consists of the two matrices: (1) a ('perceptual/sensory') product map ('factor scores) where the products are positioned in a lower dimensional product space (i.e. product X dimensions), and (2) a matrix of (sensory) attribute weights ('component loadings) relative to the dimensions of the product map to facilitate interpretation (i.e. attributes X dimensions). Finally, consumers' preference ratings (i.e. persons X products) can be fitted into the product map to allow for explanation of consumers' preferences. External preference analysis can be carried out with the PREFMAP algorithm (Chang and Carroll, 1972). The

<sup>8</sup> Here, we assume that data comes from attribute ratings, but they may also come from perceptual similarity ratings. This does not affect the fundamental structure of figure 5.1.

original algorithm of internal preference analysis is developed by Chang and Carroll (1969) and described as true multidimensional preference analysis (MDPREF).

**Figure 5.1: Methodological difference between internal and external preference Analysis**



**Controversy in choice for internal or external preference analysis**

The internal and external approaches to preference analysis work essentially from the same input data. If analyzed in maximum dimensionality (i.e. number of consumers in internal and number of products in external preference analysis), the two approaches will show identical results, but with different geographical orientation in space. In practice, however, these data are never analysed in maximum dimensionality, as the purpose is to visualise the most important information in a lower dimensional space. In the literature, the controversy whether internal or external preference analysis is superior is based on a wide range of arguments.

Green and Rao (1972, p.10) state that 'external analysis is clearly preferable in most instances, if only because the analysis of preference data alone is likely to confound differences in perception with differences in preference'. In textbooks external preference analysis receives much more attention (e.g. Hair, Anderson, Tatham, and Black, 1995; Borg and Groenen, 1997). In sensory research, external preference analysis has been suggested as the preferred mode of analysis. For example, Guinard, Uotani and Schlich (2001) applied both internal and external preference mapping and clearly favoured external preference analysis over internal preference analysis in understanding which sensory attributes drive the consumer acceptance of lager beers. Greenhoff and MacFie (1994) argue that both internal and external methods of analysis offer the same advantages to the researcher. They point, however, to the problem specifically associated with external preference analysis that one usually reduces the external data to a fewer number of dimensions than in internal preference analysis. Furthermore, they caution that the dimensions in internal maps are generated on the basis of individual linear preference vectors, which leaves no possibilities for demonstrating ideal points. This, however, is a practical rather than a conceptual issue as internal preference analysis allows for ideal point models (Coombs, 1964).

However, a major concern is that a product map spanned by perceptual data (external preference analysis) cannot accurately account for preference data (cf. Derbaix and Sjöberg, 1994; Jaeger, Wakeling and MacFie, 2000). This discussion relates closely to the long and controversial debate in the consumer behaviour literature whether perception or preference would deserve primacy in consumer understanding (Zajonc, 1980; Zajonc and Markus, 1982). The underlying assumption of external preference analysis is that products with similar attribute perceptions show similar liking judgements. Traditionally, consumer researchers have modelled the consumer decision-process according to this viewpoint, for example by the well-known 'Lens'-model (Brunswick, 1952). In this model, consumers abstract several pieces of information from product characteristics into a smaller number of perceptual attributes. Based on these perceptions, consumers develop preferences as a weighted sum of these attribute perceptions and make purchase choices accordingly. Several researchers, however, suggest that the processes underlying the construction of preference and similarity judgements are not similar. In particular, what is important to consumers when they judge the similarity of products does not necessarily match what is important to them when they evaluate products for purchase (Lefkoff-Hagius and Mason, 1993; Creusen and Schoormans, 1997). The nature of this discrepancy can be found in the fact that certain aspects of a product are relatively more (or less) important to consumers in preference judgements than in similarity judgements. It is generally accepted that products are associated with attributes, ranging from the concrete to the abstract (Johnson, 1988). Characteristic attributes are generally regarded as more concrete and physical part of the product, while benefits are more abstract in that they represent what the product is perceived to be doing or providing for the user (Meyers and Shocker, 1981; Gutman, 1982; Zeithaml, 1988). Consumers project numerous and discrete characteristic attributes (e.g. a food's color, size, and sweetness) on to fewer holistic benefits (e.g. healthiness) through a process of cognitive abstraction (Reynolds and Gutman, 1988). Preference judgements are typically defined as the outcome of this abstraction process of consumers (Johnson and Puto, 1987) and largely based on perceived benefits rather than

characteristic attributes (Meyers and Shocker, 1981). In contrast, visually salient and distinctive characteristic attributes play a relatively more important role in consumers' perceptual judgements. The reason for this is that a similarity judgement is the outcome of a comparison process (Gregson, 1975) in which the shared and distinctive characteristics of an object are systematically combined (Tversky, 1977). Derbaix and Sjöberg (1994) empirically compared preference and similarity judgements in terms of content (underlying dimensions), stability and confidence. They recommend avoiding external preference analysis as preference judgements were found to be more stable and given with more confidence than similarity judgements. The spatial representations differed between similarity and preference data with respect to underlying dimensions as well as the relative positioning of the stimulus objects, especially for highly liked stimuli. Wilson and Schooler (1991) argue similarly that analysing one's own reasons increases the weight of judgmental criteria that are highly accessible and easy to verbalise - criteria that might be in contrast to those one would normally use in spontaneous evaluations and choices.

### ***Hypotheses related to internal and external preference analysis***

Below we briefly discuss our expectations as to how internal and external preference analyses differ on statistical and end-user grounds.

#### *Varying perspectives on data*

Two products having very little in common when it comes to, for example, appearance and taste (e.g. colour, crispiness) but equally liked by consumers will be positioned very closely together in internal preference analysis. This is because in internal preference analysis product positions are chosen such that a maximum of variance in preference is achieved. However, in the external product maps these two products would be positioned on the basis of their perceived similarity. Hence, they would occupy very different positions in the external product map, rather than being closely located together. Hence, we hypothesise that:

H1 Internal and external preference analysis provide different perspectives on the same data

#### *Representing preference and perceptual data*

In external preference analysis, perceptual (e.g. sensory) dimensions are used to predict consumer preferences for products. This means that the external analysis of preferences implicitly assumes that the same underlying stimulus structure is applicable to both perceptual data and preference data. However, as argued above, preference and perceptual judgements are based on different mental contents. Internal preference analysis gives primacy to consumer preferences, as it uses preference judgements as optimisation criterion. We thus hypothesise that in contrast to external preference analysis, internal preference analysis explains more preference information of respondents. In a similar way of arguing, we expect

that consumer preference fitted in a perceptual map will be relatively less successful as the attributes on which the perceptual map is based, probably do not really matter in consumers' preference formation process. In external preference analysis, the stimulus locations in the product map are chosen such that a maximum of variance is achieved in product perception. We thus hypothesise that external preference analysis will account more for perceptual information than internal preference analysis as representation of perceptual data is the optimisation criterion in external preference analysis. Hence:

H2a Compared to external preference analysis, internal preference analysis explains more preference information of respondents

H2b Compared to internal preference analysis, external preference analysis explains more perceptual information of respondents

### *Robustness against specific selections of products*

Most food categories contain many alternatives, from which for efficiency reasons usually a subset is included in the preference analysis. Preference analysis should preferably lead to the same conclusions when products are added to, or deleted from the research design. Greenhoff and MacFie (1994) state that the question, however, how reproducible and robust internal and external preference maps are has been poorly addressed. A particular selection of products can have two effects. First, deleting or adding products to the research design can lead to distortion of true product space. For example, the deletion of a particular product from the research design may lead to an empty area in the product map exactly at the position where that product would otherwise be placed. End-users might wrongfully interpret this empty area as a promising niche in the actual market. Second, deleting or adding products to the research design can lead to distortion of the attribute-preference relationship. The dimensions of the product space are usually interpreted by means of their relations with respondents' preferences. Likewise, relating them to respondents' preferences usually assesses the importance of attributes.

The question is whether internal or external preference analysis is more stable for product omission in terms of reproducing the same configuration for the remaining products. External preference analysis cannot identify a perceptual dimension that does not have at least one attribute to represent it and varies across products included in the study. Consequently, including a product in the study design that is exceptional in one perceptual attribute will lead to a new perceptual dimension. However, this dimension will not explain that much variation, as a product from a certain category is usually characterised by several attributes. Internal preference analysis is different in this respect. If 'irrelevant' or non-comparable products are included, preferential dimensions are inferred that distinguish among comparable objects, but also among non-comparable objects (Hair, Anderson, Tatham, and Black, 1995). In other words, internal preference analysis it is more vulnerable to inclusion or omission of products with irregular preferences. In external preference analysis, in contrast, the attribute variation across products is more fixed and stable. From what precedes, the following hypotheses are formulated:

- H3a Compared to external preference analysis, internal preference analysis is less stable for product omission in terms of producing the same configuration for the remaining products
- H3b Compared to external preference analysis, internal preference analysis is less stable for product omission in terms of producing the same results regarding the relationship between attribute ratings and preferences

*Evaluating usefulness of preference map by end-users*

Preference mapping is a means and not an end in and of itself. This implies that preference analysis should provide actionable guidance to managerial action in order to optimally deliver against these preferences, both in terms of (food) technological product development and marketing. Actionability refers to the information's potential to lead the receiver to action (Desphande and Zaltman, 1982). A key characteristic of actionable information is that the findings and implications of the information can directly be linked to the user's activities and practices (Menon and Varadarajan, 1992). Maltz and Kohli (1996) refer similarly to end-users' task or application when deliberating on the appropriateness of information. Accordingly, we will evaluate the usefulness of internal and external preference maps on its actionability in terms of food technological development tasks, marketing tasks, and new product creativity.

For food technologists, it is very important to understand the product profile of own and competitive products. A large number of conclusions are drawn from the position of each product in the product map relative to (sensory) attributes. This requires first of all a bi-plot in which sensory attributes and products are widely dispersed through the space. This enables the food technologist to easily interpret which sensory attributes are connected to certain products and drive consumer preferences. For that reason, we expect external preference analysis to be more food technologically actionable as, due to its optimisation criterion: more attribute information is accounted for in the external product map. Moreover, in external preference analysis, stimulus locations are based on product similarity because perceptual data drive the orientation of the product space. Hence, dimensions reflect attribute co-variation as present in the product set. In contrast, product locations in internal preference analysis are based on a 'shared' structure that can best explain individuals' preference patterns. This does not necessarily result in realistic characteristic attribute combinations as liking drives the product space and consumers can equally like products that are perceptually heterogeneous. Hence, we hypothesise that;

- H4A Compared to internal preference, external preference analysis is more actionable in terms of food technological development tasks

For marketing purposes, it is highly relevant to be able to look at the underlying dimensions of the resulting product maps, believed to describe consumer choice criteria. Interpretation of preference maps for marketing purposes should provide insight into these key drivers of choice for the development of effective communication and product positioning strategies. In addition, for marketing purposes it is essential to explore variance in consumers' preference scores in order to be able to distinguish segments of consumers with homogenous

preferences. This implies that internal preference analysis is expected to be more appropriate for marketing purposes. In internal preference analysis, more variation in preference is accounted for. This is in contrast to external preference analysis, which often suffers from the small number of consumers that is significantly fitted (Greenhoff and MacFie, 1994; Schlich, 1995). Hence, we hypothesise that:

H4B Compared to external preference analysis, internal preference analysis is more actionable in terms of marketing purposes

One of the most significant factors affecting the profitability of established products is the search for a meaningful differentiation from competing alternatives. Strategic management theory suggests that successful organisations rely on information to detect opportunities and respond with creative solutions (Moorman, 1995). Continuous efforts of companies to differentiate their products from other products encompass not only modifications to the physical product, but also changes to other variables, such as packaging, labelling, positioning and promotion. This requires a substantial amount of creativity. Preference mapping techniques are promoted and applied as idea generation techniques as they can identify gaps in the market where there is room for a new product or a new variant of a particular product in terms of slightly different sensory characteristics (Baker and Hart, 1999; Jaeger, Rossiter, Wismer and Harker, 2003). The question arises whether internal or external preference analysis stimulates new product creativity to a greater extent. In social science research, the most widely used definition of creativity focuses on the meaningful novelty of some output relative to the conventional practice in the domain it belongs (Andrews and Smith, 1996; Amabile, 1982). Accordingly, we define preference mapping' new product creativity as the extent to which the output of preference analysis stimulates or inspires the generation of new product ideas. In contrast to the external product map, the internal product map is *not* restricted to an existing attribute and product window. As a result, when interpreting the internal preference map, end-users are exposed to new information, which can trigger associations with existing knowledge and result in novel product ideas. In other words, we expect that the internal preference map confirms the prior expectations of end-users to a lesser extent than the external preference analysis. In contrast, external preference analysis is expected to be conservative with regard to identifying new product opportunities because it will not reveal unexpected dimensions or provide new preference areas in the map.

H4C Compared to external preference analysis, internal preference analysis stimulates new product creativity of the end-user to a greater extent

Internal and external preference analyses are typically used at the marketing-R&D interface. Both techniques provide a natural link between marketing and technical food development as they relate directly to both intrinsic product quality and consumer preference. From the extant literature on the marketing-R&D interface it has become clear that it is essential for companies to integrate their R&D and marketing functions if their new products are to meet the needs of the market (Griffin and Hauser, 1996). Marketing intelligence use at the marketing-R&D interface can significantly contribute to better communication (Maltz and Kohli, 1996). Unfortunately, prior research suggests that both marketing and R&D professionals often have



an unfavourable perception of the quality of information they receive from each other. R&D professionals perceive provided marketing information as incomplete, inaccurate and not sufficient (Gupta, Raj and Wilemon, 1985). Marketing employees often complain that R&D information is too difficult to understand. These issues affect the co-operation at the marketing-R&D interface and can seriously hinder the use of market intelligence in the NPD process. Therefore, exchanged information at the marketing-R&D interface should acknowledge the comfort level that many people have for extra-functional technical jargon and use this as a starting point (Adams, Day and Dougherty, 1998). As argued above, external preference analysis is restricted to an existing and hence feasible product window. In contrast, internal preference analysis may lead to unexpected and perhaps infeasible product areas in the map. Hence, we expect that internal preference analysis will lead to more disagreement between experts of different functional background than external preference analysis.

H4E Compared to internal preference analysis, external preference analysis will be perceived as more appropriate to be used at the marketing-R&D interface.

*Finally*, the comprehensibility of information concerns the ease with which the receiver of information can decode and understand the information (Moenaert and Souder, 1996). As mentioned earlier, the internal product map is not restricted to an existing attribute and product window. Hence, end-users may have difficulty in understanding the underlying preference dimensions of consumers and relations between preferences and perceptions in internal preference analysis. Therefore, we hypothesise:

H4F Compared to internal preference analysis, external preference analysis will be perceived as more comprehensible.

### **5.3 Methodology**

#### ***Stimuli***

This study involved 18 tomato-based pasta sauces, chosen to cover a broad area of the sensory space. Hot, spicy, and meat-flavoured products were excluded to restrict the analysis to traditional pasta sauces.

#### ***Respondents***

The research sample of this study consisted of a consumer panel (n=188) to obtain the preference data, a trained sensory panel (n=10) to obtain the perceptual data and an end-user panel (n=17) to evaluate the resulting product maps. The consumer panel respondents (aged 18-54) all used tomato sauces at least once a month and were main grocery buyers of their household. Because in practice the interpretation of preference maps is specialist knowledge, we used users of preference analysis output active at the marketing-R&D interface from universities, companies and research institutes. Seventeen users were identified that regularly

work with the output of preference analysis. This group involved consumer scientists (n=6), market researchers (n=4) and sensory analysts (n=7).

### **Procedure**

Individual consumer's preference data were collected over two nights. Preference ratings were expressed on 9-point scales ranging from 'not liked at all' to 'very much liked'. On the first night nine sauces were evaluated for liking. On the second night, another nine sauces and a repeated sample (from those evaluated on the first night) were evaluated. A sensory panel was trained in several sessions. First, several sessions were held with the objective of reaching an agreement on the meaning of each attribute. At the end of this process of vocabulary development, the panel agreed on 35 attributes to describe the pasta sauces. The trained panel evaluated the pasta sauces on 35 (sensory) attributes, with end points labelled by intensity (e.g. 'chunky' to 'not at all chunky'). The evaluations were conducted in triplicate (cf. Greenhoff and MacFie, 1994). The first sample given was a dummy sample as panellists tend to give disproportionately high scores to the first sample tasted (Land and Shepherd, 1984). After the preference and perceptual data were obtained and the internal and external preference analyses were carried out, the end-users evaluated the resulting product maps<sup>9</sup>.

### **Statistics**

In external preference analysis, Principal Component Analysis (PCA) was conducted on the covariance matrix. The covariance matrix was used as input for the PCA to prevent that differences attributable to both the mean and the dispersion of individuals would be removed. Attribute ratings were used as raw input. A number of statistical criteria was applied to the choice of the dimensionality and interpretation of the product map (Stewart, 1981). On the basis of these criteria, four dimensions were extracted together accounting for 81.4% of the variance in ('perceptual') attribute ratings. For internal preference analysis, PCA was used to reduce the size of the covariance matrix of liking scores with respondents as columns and the 18 products as rows. The decision on the dimensionality of the reduced matrix was based on a number of statistical criteria. Together, these pointed to a four dimensional solution accounting for 63.0% of the variance in (preference) data. Overall, the internal and external preference analyses yielded solutions in the same (i.e. four) dimensionality. These results will be evaluated and compared on the defined measures. Two-dimensional internal and external maps are presented in Appendix 1.

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<sup>9</sup> Please note that in this exploratory study, we only focus on traditional internal and external preference analysis. The data could also have been subjected to preference clustering as well as alternative external preference regression models (e.g. ideal point models) before the output being shown to end-users.

## **Testing hypotheses 1-4**

### *Varying perspectives on data (hypothesis 1)*

Correspondence between the product maps obtained from internal and (the varimax rotated) external preference analysis, was assessed from two criteria: (1) correlation between the dimensions of the product maps significantly lower than 1, (2) cross-matrix explanation (i.e. how much of each of the internal dimensions is explained from the four external dimensions and vice versa). Note that the first measure takes the product maps 'as they come' and typically will be interpreted by the user. The second measure takes into account the fact that the two maps may essentially contain the same information but with a different choice of (four-dimensional) directions. The multivariate regression approach accounts for (statistically arbitrary) differences in direction and scaling.

### *Representing of preference and perceptual data (hypothesis 2)*

In both internal and external preference analysis, the individual consumer's preference ratings are not averaged over consumers, but usually represented on the map. The recovery of these preferences is represented in the percentage variance explained. For each individual respondent preference regressions were conducted on the basis of both the internal and external product map (cf. Steenkamp, Van Trijp and Ten Berge, 1994). This yields two sets of  $R^2$  values reflecting the predictive validity of the dimensions of the internal and external product maps respectively. Similarly, adequacy in the representation of the perceptual information can be assessed from variance accounted for in property fitting models per attribute on the basis of internal and external product maps respectively. We estimated the following regression equation for both preference and perceptual data:

$$Y_{ij} = b_{i1}X_{1j} + b_{i2}X_{2j} + b_{i3}X_{3j} + b_{i4}X_{4j} + e_{ij}$$

where  $Y_{ij}$  denotes the dependent variable (i.e. preference score of subject  $i$  on product  $j$ , perceptual score of subject  $i$  on attribute  $j$ ),  $X_{1j-4j}$  denotes the product locations of dimension 1-4 and  $e_{ij}$  is the error term. As both analyses involve the same respondents and products, the difference between internal and external preference analysis can be analysed through a paired t-test on  $R^2$  values across respondents. Analysis was restricted to the linear preference model (no quadratic effects included).

### *Robustness against specific selections of products (hypothesis 3)*

The fourth measure involves the robustness of the method against deletion and omission of products and brands. This was tested through an assessment of structural stability (cf. Steenkamp, Van Trijp and Ten Berge, 1994). In practice, most studies typically involve only a subset of all products (generally 12-18) available in the market place (Nute, MacFie and

Greenhoff, 1988). Random subsets of 15, 12 and 9 products were selected from the total set of 18 products. For each subset-size 500 random sub-samples were drawn and these subsets were submitted to internal and external preference analysis (procedures as above). On the basis of the outcomes of these analyses, two relevant aspects can be assessed on which internal and external preference analysis can be compared. First, the extent to which deletion of products yields the same configuration for the remaining products. Multiple linear regression was applied for product locations on the dimensions of the total sample-based product map onto the dimensions of the sub-sample based product map. The root mean squared multiple correlation across dimensions was used to compare internal and external preference analysis. In addition, procrustean analysis was applied on the two product maps (scaled according to the square roots of the eigenvalues of the PCA's that produced them) to assess structural similarity while accounting for differences in orientation. The correlation between the two product maps served as a measure of structural reliability. Second, the extent to which deletion of products yields the same results regarding the relations between attribute ratings and preference. This was measured through the extent to which both covariances and correlations between attribute ratings and respondents' preference were reproduced in the sub-sample based analyses. This is expressed as the mean squared difference between actual covariances/correlations and reproduced covariances/correlations. Hence, lower values on this measure represent better structural reliability.

#### *Evaluating usefulness of preference map by end-users (hypothesis 4)*

Based on the defined constructs, measures were developed from the existing literature. *Food technological actionability* was measured by five items derived from John and Martin's (1984) scale for measuring the specificness of information. It covers that product positions can be interpreted accurately and precisely in light of other product information (sensory characteristics, physical measurements, or ingredients) and consumer preferences. *Marketing actionability* relates to understanding the choice consumers make in the market place and determining the product policy accordingly. Effective product positioning (item 2) based on understanding the forces of competition explicitly deals with the relation of perceptions to preferences. In addition, preference analysis should provide an accurate description of consumer preferences and choice to be emphasised in communication (item 1) and optimal insight in terms of relevant consumer segments that fundamentally differ on the basis of their product preferences (item 3). A six-item scale assessed *new product creativity*. Creativity has been referred to as 'divergent thinking', 'thinking with an open mind', and 'searching through a space of possibilities' (Mathôt, 1982; Dahl and Moreau, 2002). Accordingly, new product creativity is operationalised by the extent to which the output of preference analysis can be used to identify gaps in the market, change the frame of reference of end-users and inspire to innovate (item 1, 3, 4 and 6). In addition, items 2 and 5 measure whether the output will lead to new products. A three-item scale was used to measure *marketing-R&D interface appropriateness*, based in part on Gupta and Wilemon's (1988) work. Finally, to measure comprehensibility, a short scale (3 items) was developed based on the scale of Moenaert and Souder (1996) and Maltz (2000).

The end-user data were collected by means of a personal interview in which respondents were confronted with the output from internal and external preference analysis and asked to evaluate the output. The applied analysis (internal or external) was not revealed to respondents. As a 'warming-up' task they were asked what they specifically look for in bi-plots. Next, they were asked to evaluate both sets of bi-plots in terms of food technological actionability, marketing actionability, new product creativity, marketing-R&D interface appropriateness and comprehensibility. All items were measured on 11-point strength of preference scales, with mid-point 0 labelled 'identical' and end-poles labelled as 'bi-plots A superior (-5)' and 'bi-plots B superior (+5)'. Bi-plots A were external preference analysis plots. Bi-plots B were internal preference analysis plots. Reliability procedures applied to the measures included factor analysis and calculation of Cronbach's alpha in accordance with the recommendations of Churchill (1979).<sup>10</sup>

## 5.4 Results

### *Varying perspectives on data*

Table 5.2 shows Pearson bivariate correlation coefficients between the product locations in the internal map and those in the Varimax-rotated external map. As expected, it was found that internal and external preference analyses are substantially different and hence represent fundamentally different perspectives on the data. All correlations were relatively low (0.605 and below) and except for the last mentioned correlation of 0.605, they were all significantly lower than 1 ( $p < 0.05$ ), which indicates that the factors extracted in external preference analysis do not correspond with the factors extracted in internal preference analysis. Moreover, the multivariate (i.e. insensitive to Varimax rotation) analyses reveal that the squared multiple correlation is not high, except for factor 1 of internal preference analysis which is relatively well explained by the internal preference analysis ( $R^2 = 0.793$ ). Hence, hypothesis 1 thus is confirmed.

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<sup>10</sup> We examined the item-to-total correlations for the items in each of the proposed scales and deleted items that did not represent an additional domain of interest. With one exception (marketing actionability with Cronbach's alpha=0.52), construct reliabilities exceed 0.70 and lie in the acceptable range suggested by literature (Peter, 1981). For marketing actionability, the 3 marketing actionability items were found to load highly on a single factor in factor analysis but reliability analysis did not confirm that they form a single scale. Hence, the composite score of marketing actionability (see table 5.4) should be considered with care and be interpreted in light of the constituting items.

**Table 5.2: Similarity between internal and external product maps expressed as bivariate Pearson correlations and explained variance from multivariate regression analysis**

Dimensions from external analysis	Dimensions from internal analysis				External dimensions explained from internal dimensions (R <sup>2</sup> )
	1	2	3	4	
1	-0.612 <sup>b</sup>	0.246 <sup>b</sup>	-0.074 <sup>b</sup>	-0.098 <sup>b</sup>	0.451
2	-0.382 <sup>b</sup>	0.283 <sup>b</sup>	0.605	0.312 <sup>b</sup>	0.660
3	0.490 <sup>a</sup>	0.427 <sup>a</sup>	-0.096 <sup>b</sup>	-0.098 <sup>b</sup>	0.441
4	0.178 <sup>b</sup>	0.531 <sup>a</sup>	-0.053 <sup>b</sup>	0.434 <sup>a</sup>	0.505
Internal dimensions explained from external dimensions (R <sup>2</sup> )	0.793	0.605	0.384	0.305	

<sup>a</sup> significantly lower than 1, p<0.05

<sup>b</sup> significantly lower than 1, p<0.01

### ***Representing of preference and perceptual data***

The mean fit in the external preference analysis is 0.486 (i.e. 48.6%) with a standard deviation (S.D.) of 0.18. For about half of the respondents (98 out of 188) the fit was higher than 0.494 and hence statistically significant (p<0.05). In line with hypothesis 2a, internal preference analysis accounted for 61.7% (S.D.=0.16) of the variance in consumer preferences which is significantly higher than external preference analysis (t=11.2; p<0.00). For 150 out of 188 respondents the fit of the internal model was statistically significant (p<0.05). The mean attribute fit across all 35 attributes was 0.757 in external preference analysis and ranged from 0.168 'flavour of any type of cheese' to 0.972 'herby appearance'. In line with hypothesis 2b, this 75.7% explained variance through external analysis is significantly higher (t=-7.32; p=0.00) than the 52.5% of the attribute variation explained through the internal map. The fit in internal preference analysis ranged from 0.170 'coating of pasta by sauce' to 0.828 'brown colour'.

### ***Robustness against specific selections of products***

Table 5.3 gives the results for the stability analysis on random selections of 15, 12 and 9 out of the 18 products. As can be inferred from table 5.3 external preference analysis significantly outperforms internal preference analysis on all structural stability criteria. In line with hypothesis H3a, this means that the perception-based product map is less sensitive to selective inclusion/omission of products than is the internal preference analysis. Obviously, such differences will reduce the more complete the product set included in the analysis. Also in line with hypothesis H3b, the results of internal preference analysis are more sensitive to inclusion/exclusion when it comes to the structural relations between preferences and attribute ratings. In external preference analysis these attribute-to-liking relations are quite stable

against deletion of products. In internal preference analysis this is statistically significantly less so the case.

**Table 5.3: Results on structural stability on deletion of subsets of products**

	15 products			12 products			9 products		
	External	internal	t-value	external	internal	t-value	external	internal	t-value
<i>Deletion of products yields same configuration for remaining products?</i>									
Msmc	0.9931	0.9482	13.36	0.9777	0.9088	17.64	0.9666	0.8959	19.11
Procr.	0.9963	0.9745	13.44	0.9855	0.9441	18.59	0.9691	0.9091	23.72
<i>Deletion of products yields same relations between attribute ratings and preferences?</i>									
MsDcov	0.0030	0.0165	-12.05	0.0133	0.0444	-15.82	0.0326	0.0927	-19.13
MsDcor	0.0004	0.0021	-11.91	0.0018	0.0059	-14.98	0.0054	0.0132	-17.10

Explanation of measures:

- Msmc = mean squared dimension-wise multiple correlations
- Mssq = mean variance accounted for (weighted index measure)
- Procr. = structural similarity after Procrustes rotation to correct for orientation
- MsDcov = mean squared difference between actual covariances and reproduced co-variances between attribute ratings and preference
- MsDcor = mean squared difference between actual correlations and reproduced correlations between attribute ratings and preference

### **Evaluating usefulness of preference map by end-users**

The perceived differences between internal and external maps in terms of perceived food technological actionability, marketing actionability, new product creativity, marketing-R&D appropriateness and comprehensibility are summarised in table 5.4. Negative mean deviations from the midpoint of the scale indicate that respondents favoured external preference analysis bi-plots, while positive mean deviations from the midpoint indicate that respondents favoured internal preference analysis bi-plots. Consistent with hypothesis 4A, it was found that external preference analysis was perceived as having a higher food technological actionability ( $t=-3.15$ ;  $p=0.01$ ). This holds for all items, except item 3 and 5. In line with hypothesis 4B, internal preference analysis was found to have a higher marketing actionability ( $t=3.84$ ;  $p=0.00$ ). Internal preference analysis was particularly favoured to be used for segmentation purposes ( $t=6.73$ ;  $p=0.00$ ). Consistent with hypothesis 4C, it was found that internal preference analysis was significantly higher rated on new product creativity ( $t=-2.41$ ;  $p=0.03$ ). Contrary to hypothesis 4E, internal and external preference analysis did not differ in terms of marketing-R&D interface appropriateness ( $t=-0.64$ ;  $p=0.53$ ). Finally, no support was found for hypothesis 4F, which states that external preference analysis will be evaluated as more comprehensible than internal preference analysis. Although all items are in hypothesised direction, the effect is not significant ( $t=-1.52$ ;  $p=0.15$ ).

**Table 5.4: Scale mean deviations of midpoint 0 (sd) and t-test of differences between internal and external preference maps**

<b>Constructs</b>	<b>Mean (sd)</b>	<b>t-value</b>	<b>p-value</b>
<b><i>Food technological actionability (<math>\alpha=0.76</math>)</i></b>	<b>-1.13 (1.48)</b>	<b>-3.15</b>	<b>0.01</b>
1. Provides relevant information for food technological development of products	-1.82 (1.74)	-4.32	0.00
2. Provides relevant information for sensory optimization of existing products	-1.76 (1.86)	-3.92	0.00
3. Provides important details of sensory characteristics in relation to consumer preferences	-0.35 (2.50)	-0.58	0.57
4. Enables me to link consumer preferences to physical measurements, ingredients or sensory characteristics	-1.06 (1.98)	-2.20	0.04
5. Enables me to react appropriately to consumer preferences in the actual development of a product	-0.65 (2.34)	-1.14	0.27
<b><i>Marketing actionability (<math>\alpha=0.52</math>)*</i></b>	<b>1.24 (1.33)</b>	<b>3.84</b>	<b>0.00</b>
1. Provides relevant information of key drivers of consumer choice to be emphasized in communication	0.88 (1.73)	2.11	0.05
2. Provides relevant information of key drivers of consumer choice to be used in the positioning of a products in consumers' mind	0.82 (1.78)	1.91	0.07
3. Provides relevant information of key drivers of consumer choice to be used for segmentation purposes	2.00 (1.22)	6.73	0.00
<b><i>New product creativity (<math>\alpha=0.88</math>)</i></b>	<b>0.76 (1.41)</b>	<b>2.23</b>	<b>0.04</b>
1. Provides relevant information of key drivers of consumer choice to be used in identification of gaps in the market	1.29 (2.37)	2.26	0.04
2. Will lead to new products in the eyes of consumers	0.71 (1.96)	1.48	0.16
3. Offers me a new frame of reference for new-to-develop products	0.59 (1.66)	1.46	0.16
4. Encourages me to think outside my current frame of reference	0.53 (1.50)	1.45	0.17
5. Will lead to new products that are easily copied by competitors (R)	0.88 (1.65)	2.20	0.04
6. Inspires me to innovate	0.59 (1.58)	1.53	0.15
<b><i>Marketing-R&amp;D interface appropriateness (<math>\alpha=0.88</math>)</i></b>	<b>-0.21 (1.30)</b>	<b>-0.64</b>	<b>0.53</b>
1. Stimulates to understand each other better (marketing and R&D)	0.06 (1.64)	0.15	0.88
2. Enables me to talk in a common language to other functions (marketing and R&D)	-0.24 (1.35)	-0.72	0.48
3. Helps me to communicate open and honest with other functions (marketing and R&D)	-0.24 (1.30)	-0.75	0.47
<b><i>Comprehensibility (<math>\alpha=0.75</math>)</i></b>	<b>-0.46 (1.20)</b>	<b>-1.52</b>	<b>0.15</b>
1. Is displayed in an understandable way	-0.47 (1.42)	-1.37	0.19
2. Will lead to indistinctness in interpretation (R)	-0.47 (1.55)	-1.26	0.23
3. Is easy to understand	-0.24 (1.60)	-0.61	0.55

\* Care should be taken to interpret the overall scale



## 5.5 Discussion and future research

The purpose of both internal and external preference analysis is to understand the competitive positioning of products in the market place and combine this information with consumer preference directions. The choice for internal or external preference analysis, however, is unclear and often debated in the literature. The present study aimed at providing a comprehensive conceptual and empirical comparison of both techniques by critically comparing them on a set of analytical criteria. First of all, it is important to note some limitations of this study. One limitation relates to the structural reliability criterion on which the two techniques were compared. In this data set of tomato based pasta sauces external preference analysis showed a better reliability than internal preference analysis. However, this may be the result only for this particular data set. Further research with other data sets is therefore required.

Overall, the basic conclusion of this study is that both internal and external preference analysis emphasise fundamentally different, but complementary perspectives on the data. Internal preference analysis better accounts for consumer preferences and hence captures 'consumer understanding' while external preference analysis better accounts for perceptual or sensory information and hence captures 'product understanding'. These findings are in a sense not surprising; both internal and external preference analysis function consistent with their optimisation criteria. But even though our findings sound sensible and logical, our study furthermore revealed that they have large implications for end-users of both techniques. On the one hand, end-users perceive information from external analysis as particular actionable for food technological tasks. As we argued earlier, this may due to the wide dispersion of perceptual attributes in space, which makes it easier for end-users to create an optimal combination of ingredients. On the other hand, internal preference analysis holds a clear advantage on marketing actionability and new product creativity. The reason for this might be that the resulting product space in internal preference analysis usually reveals more unexpected gaps with room for new products, not necessarily based on existing combinations of attributes. This stimulates the creativity of end-users to a greater extent.

This means we face a dilemma: which technique can best be selected for new product development applications where the purpose is to account for jointly consumer and product viewpoints? From this analysis it is obvious that the dilemma between internal and external preference analysis need to be relieved to make preference analysis an even more useful tool for application, for example in new product development. A very pragmatic approach to this problem is to always conduct both internal and external preference analysis on any given data set to allow for the two perspectives. However, such approach would not solve the problem of having to make a choice as to whether priority should be given to consumer perception and food technological actionability on the one hand or consumer preferences and marketing applications on the other. To illustrate the potential divergence in perspectives on the data, consider the following hypothetical example from the movie industry. Assume that consumers appreciate both Arnold Schwarzenegger and Richard Gere as male movie stars. Obviously, these two actors have very little in common when it comes to consumer perception in terms of, for example, posture and appearance. Yet, they have both a history and reputation of

successful movie stars and let us assume that this is recognised by consumers. In the 'product' map obtained from internal preference analysis, these actors will be positioned very closely together and away from movie stars that enjoy less popularity among consumers. This is because in internal preference analysis product positions are chosen such as a maximum of variance in liking/preference is explained. Whilst such product map would be quite effective in explaining consumer preferences, its actionability for 'new product development' would be quite limited. After all, it is hard to imagine which 'technical features' are shared by Arnold Schwarzenegger and Richard Gere that could serve as meaningful targets for the launching of a new well-appreciated male movie star. In external preference analysis, Arnold Schwarzenegger and Richard Gere would be positioned in the product map on the basis of their perceptual similarity. Hence, they would occupy very different positions in the map, rather than being located closely together. Consumer preference would then be fitted in this perceptual map and the perceptual map would be relatively unsuccessful in accounting for the preferential information that both Arnold Schwarzenegger and Richard Gere are well liked by consumers. However, the preferential information exposed in the product map would provide actionable guidance to the 'tangible' product features that a newly launched male actor should have. In this approach, it is the actionability for new product development that is optimised, largely at the expense of accurateness and completeness in accounting for preference information. This movie star illustration indicates that instead of simply applying both techniques, it is much more valuable to adjust and refine the methods to find a better balance between the two insights into the data.

*First of all*, concerning refining external preference analysis, we can conclude that the key shortcoming of external preference analysis is that, whilst optimally accounting for the (sensory) perceptual data, it is not optimal in terms of accounting for consumer preferences. There are two related problems here. The first problem is that preference data are entered into the analysis as supplementary information for which predictive validity is not optimised in the algorithm. The second problem relates to the fact that preference data are added into the means of individual level regression analyses, which has statistical effects. The individual level regression analyses have the number of products as their number of observations. In practice, this seriously restricts the number of degrees of freedom in the analysis and hence the power of the test. Furthermore, it reveals itself in very few of the individual regression analyses reaching the level of statistical significance. A first refinement of external preference analysis would be to base the consumer perceptual map on attributes that really matter in consumers' preference formation processes. Present and related evidence suggests that sensory perceptual product information is only partly successful in explaining consumer preferences. Jaeger, Wakeling, and MacFie (2000) suggest applying different sets of weights reflecting differences in the relative importance consumers give to each sensory attribute. Another way forward here would be to find consumer perceptual data at a more abstract level that is closer to consumers' true motivation of product choice. A second refinement in external preference analysis should focus on the 'degrees of freedom' problem in the individual preference regression analyses. This problem has a fairly straightforward solution as it has been addressed in many recent marketing research studies. The recent development and application of (maximum likelihood-based) latent class mixture models in marketing research

(e.g. Wedel and Kamakura, 1998; Courcoux and Chavanne, 2001) provides a means to estimate these preference regressions at the level of homogeneous consumer segments. They allow for the simultaneous identification of segments and the key preference direction within each of these consumer segments. An alternative to the maximum-likelihood-based mixture approach is the Bayesian hierarchical mixture approach (e.g. Allenby, Arora and Ginter, 1998; Ter Hofstede, 1999).

*Second*, internal preference analysis suffers from the same problems as external preference analysis. Basically, it seems that the output of internal preference analysis should be redefined for easier interpretation. As the length of the preference vectors is arbitrary (i.e. does not necessarily reflect the variance accounted for in the property fitting), this layout issue can easily and should be improved in internal preference analysis. However, most problematic in internal preference analysis is the link with the physical product. One way to refine internal preference analysis would be to refrain from defining a single optimal point in space, as is the common procedure. It should be possible to provide technical product developers with a variety of scenarios that would all constitute directions for well liked (although not necessarily the most liked) product propositions. Discussions with consumer scientists could then lead to an interactive process. Finally, another promising area consists of the constrained internal preference models, which constrain the choice of the dimensions to those that are linear (or non-linear) functions of a set of fixed external variables (Heiser, 1981; Desarbo and Rao, 1986; Van der Lans, Groenen and Borg, 1998). In the context of internal preference analysis for new product development, such constraint could be that in the product map only attribute combinations that are feasible from a technical point of view are mapped closely together. This approach might hence allow to build-in technical product developers' expertise on what attribute level combinations can feasibly be combined into any new product proposition in the product category.

In summary, we can conclude that both methods have their merits and shortcomings. The results of this study provide insights into the way end-users of internal and external preference analysis evaluate the resulting product maps. End-user evaluation of product maps has not been addressed before, even though the understanding of why consumer preferences are as they are constitutes the key output of preference analysis on which managerial action is generally based. Hopefully, end-users' information needs and wants will be increasingly taken as a starting point in the improvement of methods and techniques for new product development. There are numerous opportunities for future research to improve both the methods and interpretations of internal and external preference analysis.

## Appendix 1

Figure 5.2 Retained variance in two-dimensional external space

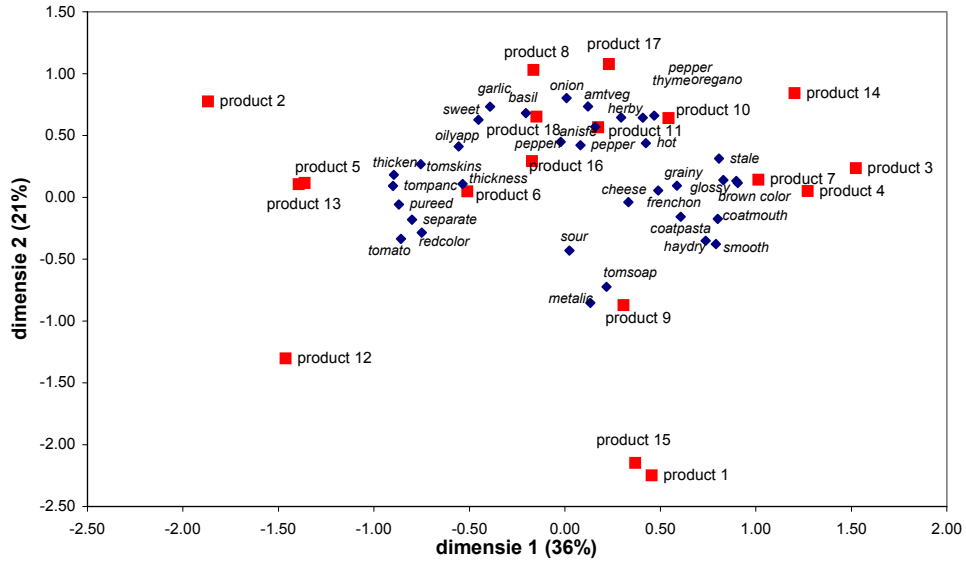
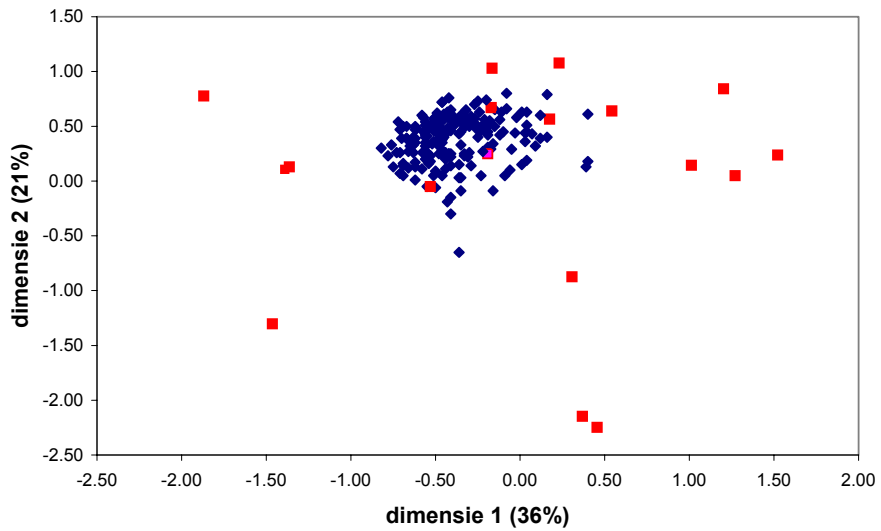
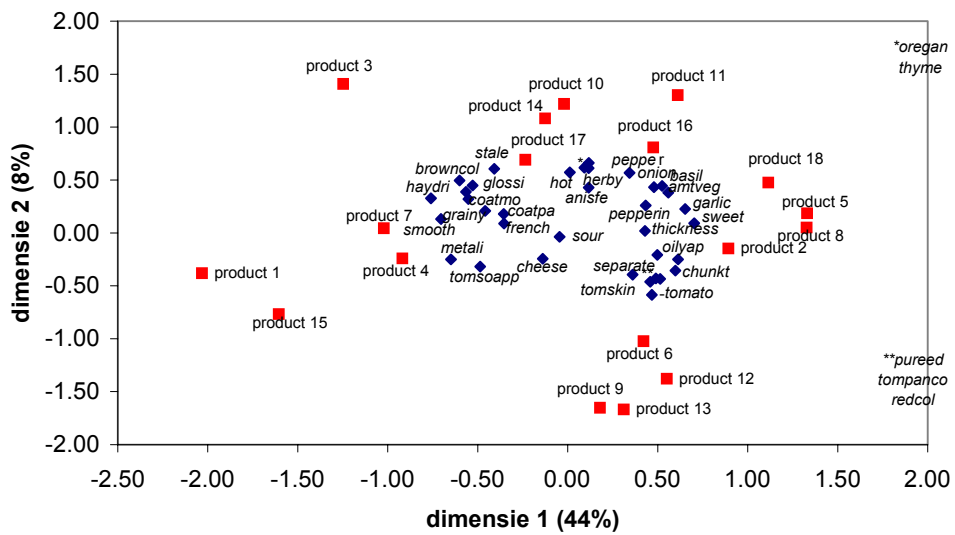


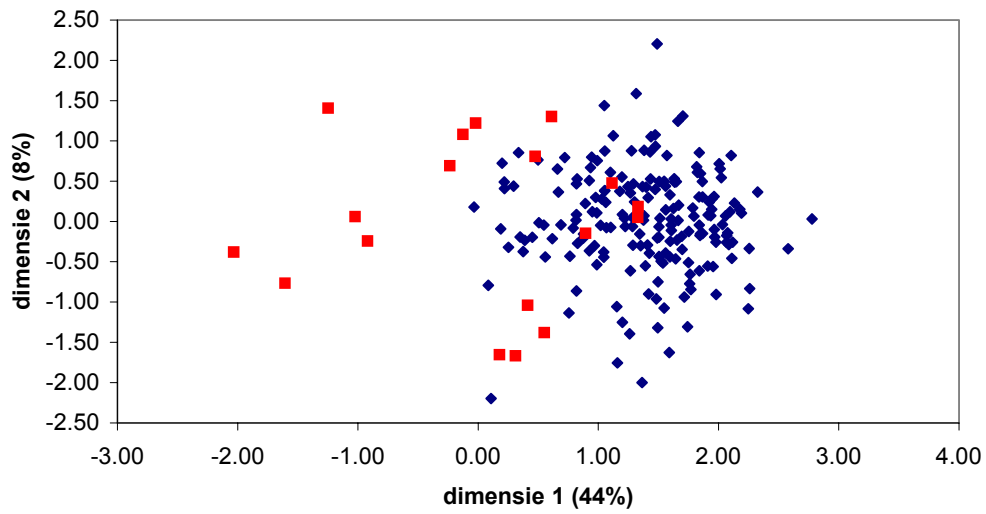
Figure 5.3: Preference vectors of 188 consumers (shown as  $\blacklozenge$ ) in external product space



**Figure 5.4: Retained variance in two-dimensional internal space**



**Figure 5.5: Preference vectors of 188 consumers (shown as  $\blacklozenge$ ) in internal product space**





# Chapter 6

## Innovation templates in new product development

### **Abstract**

This final empirical chapter studies different aspects of the innovation templates approach, which is recently introduced in the marketing literature. In recent years, it is increasingly argued that using ordinary consumers as a starting point in idea generation has serious drawbacks. Consumers find it difficult to express their needs and wants for products which are not yet in the market place. The innovation templates approach is built on the contention that to overcome this problem, companies should listen to 'the voice of the product' rather than the 'voice of the consumer' as a source of new product ideas. Innovation templates are a set of systematic operators which help to transform the product from an earlier version to a new version. This study showed that innovation templates provide a recognisable structure in fast moving consumer goods and particularly for relatively low involvement products like foods. In addition, this study explored whether the templates enhance market success by examining actual market success rather than expert evaluation of new product ideas or historical analysis of new product survival. Although no positive overall effect of being template-based was found, a positive template effect was found for products with high perceived complexity and incongruity. This implies that innovation templates are particularly instrumental in enhancing market success of complex and incongruent (as opposed to more simple) innovations.

## 6.1 Introduction

In the last decades, numerous new product development (NPD) performance studies have shown that aligning new products with consumer needs and differentiation from competitors is of crucial importance for success in the market place (see review of Henard and Szymanski, 2001). One of the most important factors leading to new product success is providing a unique and superior product in the eyes of the consumer (Cooper, 1979; Cooper, 1993). This has resulted in structured procedures that challenge new product ideas at their various stages of development against consumer judgment. The best known of these procedures is the stage-gate-process, consisting of a five-stage, five gate model in which new product ideas are developed and tested before a go or no-go decision is made at each of the subsequent gates (e.g. Cooper, 1990; O'Connor, 1994). The implementation of these structured processes to challenge and verify new product ideas against consumer assessment is identified as a key success factor in NPD. However, increasingly it is being recognised that the quality of the ideas entering the NPD process is at least equally important to NPD success as structured approaches (Wind and Mahajan, 1997). In fact, predevelopment activities (i.e. those activities carried out before products enter the development stage) are among the most critical activities associated with success (Cooper, 1988; Roozenburg and Eekels, 1995; Henard and Szymanski, 2001). In these pre-development activities, important and (partly) unfulfilled consumer needs are being identified as a source of new product ideas and these new product ideas are assessed on their feasibility and consumer appeal very early on in the process.

Although bringing the voice of the consumer upfront in the NPD process is an important success factor, in recent years several authors have also pointed toward potentially serious limitations of using 'average' or a random set of consumers as the starting point of NPD idea generation. It is argued that being market and consumer-oriented has incorrectly been confused with being *consumer-driven* NPD (e.g. Zaltman, 2003; Narver, Slater and MacLachlan, 2004; Van Kleef, Van Trijp and Luning, 2005a). Such consumer-driven approaches where the consumer is to large degree the origin of new product ideas would assume that (1) consumers are able to identify and articulate unfulfilled needs, and (2) consumer are able to identify and articulate potential solutions to these unfulfilled needs almost as recipe for new products (e.g. Van Trijp and Steenkamp, 2005). However, several authors (Slater and Narver, 1998; 1999; Connor, 1999; Reid and De Brentani, 2004) argue that consumers find it difficult to articulate their needs for products that do not yet exist. As consumers are limited by their current experiences and environment, their input is believed to inhibit new ideas (e.g. Lilien et al., 2002). As a result, companies may fail in noticing emerging markets and consumer needs. Particularly, it has been argued that this approach may lead to 'me-too' products rather than real innovations.

Several researchers have suggested alternative approaches to overcome this problem of ordinary consumers not being able to articulate their future product needs. For example, the lead user approach (Von Hippel, 1986) involves more advanced consumers rather than ordinary consumers when it comes to need and solution identification. Lead users are selected on their characteristic of recognizing a particular product need much earlier than average consumers. They may have even developed their own products to solve their problems with



existing products (Von Hippel and Katz, 2002). The Zaltman Metaphor Elicitation Technique (ZMET) was developed to overcome similar problems with traditional methods of consumer research (Zaltman, 2003). In this approach, researchers attempt to tap into the unconscious level of consumers' thinking by including unconventional inquiry techniques (see for an application of this technique Christensen and Olson, 2002).

With their innovation templates approach to new idea generation, Goldenberg, Mazursky and Solomon (1999) have somewhat provocatively argued that companies should listen to the 'voice of the product' rather than the 'voice of the customer' as a source of new product ideas. The argument is that large percentage of the innovation potential of any product resides in the structure of that (food) product. The innovation templates approach builds on three major premises: (1) structured creativity, (2) restricted scope, and (3) function follows form. Together, these three principles define a structured ideation approach (see next section), which is claimed to enhance NPD success. Empirical studies on the contribution of innovation templates in NPD success are scarce, the only evidence coming from two studies by Goldenberg and colleagues (Goldenberg, Lehman and Mazursky, 2001). Goldenberg and colleagues argue that the rationale behind the success of the templates is that by their very nature of systematic variations on existing products, they facilitate consumer evaluation by providing a sense of familiarity to an otherwise unexpected and novel product idea. In Goldenberg terminology (Goldenberg and Mazursky, 2002: page 35), 'they help balancing surprise and regularity, two desirable characteristics in original thinking'. Or as Boden (1991) phrased it 'constraints and unpredictability, familiarity and surprise, are somewhat combined in original thinking'. Goldenberg claims that templates address the structural, rather than surface similarities between a new product (idea) and the existing knowledge of consumers. In other words, they provide "deep" analogies, those that force the generation of new and more general rules, rather than simply providing an occasion for applying rules already learned to a new example (Goldenberg and Mazursky, 2002: page 36). This is an interesting, yet unchallenged, contention of the approach as it touches directly on the issues of product newness and consumer acceptance of innovations. New products and new product ideas can be classified on the basis of their newness and recent research (Michaut 2004) provides evidence that (1) perceived newness is not a uni-dimensional construct, and that (2) consumer perceptions of product newness consistently relate to two underlying dimensions: incongruity (perceptual newness) and complexity (conceptual newness) and that (3) these two dimensions of newness have differential effects on consumer acceptance of new products. The two dimensions identified by Michaut (2004) show strong similarities to Goldenberg's contention of surface versus structural similarities. Michaut (2004) argues that particularly complex products have difficulty in generating consumer acceptance due to lack of coherence with existing knowledge. Goldenberg and Mazursky (2002) argue that innovation templates are particularly instrumental in providing consumers with a context of structural similarity between the new idea and existing knowledge. This implicit structural similarity, which remains largely unobserved to consumers (in contrast to surface similarity), provides consumers with a balance between surprise on the one hand and a sense of familiarity on the other. This would imply that when a new food product is perceived as complex by consumers, the beneficial

effect of template-match is higher than for new products not perceived as complex by consumers.

The aim of this paper is to assess the added value of innovation templates in NPD success. We extend the existing literature in three directions. First we explore whether innovation templates provide a recognisable structure in fast moving consumer goods and particularly relatively low involvement products like foods. Second, we attempt to replicate Goldenberg et al's findings on the enhancement of market success from innovation templates in the early stages of the NPD process. We extend this work by exploring actual market success rather than expert evaluation of new product ideas or historical analysis of new product survival. Finally, we test the contention that innovation templates are particularly instrumental in enhancing market success of complex and incongruent (as opposed to more simple) innovations.

## **6.2 Theoretical background and hypotheses**

### ***Three key premises underlying the innovation templates approach***

Templates are a set of systematic thinking frameworks. In the process of generating new ideas, an innovative product idea is obtained by a sequence of generic innovation operators (called templates) on the initial structure of an existing product. Goldenberg and colleagues (e.g. 1999; 2000; 2002; 2003) identified six underlying mechanisms that lead to a creative output by analysis of historical product changes, inspired by the work of the Russian engineer Altshuller (1986). These form the basis of their approach which, as argued before, builds on three important premises (Goldenberg and Mazursky, 2002: page 41):

1. Structured creativity: several identified, universal templates underlie product evolution and these can be exploited to predict new candidate products
2. Restricted scope principle: channelling thinking along pre-defined inventive routes makes people more productive in idea generation
3. Function follows form: enhancing the recognition of innovative ideas by applying an unusual sequence: first new configurations for a product are proposed, for which potential consumer appeal is inferred afterwards (rather than 'form follows function' as usually applied in more traditional NPD approaches).

#### *Structured creativity*

The generic procedure starts by listing the essential elements of a product, both its physical components and its attributes, such as colour and shape. The product's immediate environment is also taken into account, such as type of consumer using the product or outside temperature. Then, following one or more of the templates, these components and attributes are manipulated to come up with a new product configuration. The six basic template operators can be characterized as follows (see also Goldenberg, Mazursky and Solomon,

1999; Goldenberg and Mazursky, 2002). The *attribute dependency* template is based on finding two independent variables (i.e. a change in one does not cause a change in the other) and creating a new dependency between them. Take, for example, a standard mayonnaise product. There is no dependent relation between an ingredient (i.e. mustard) and an external situation (such as 'region of origin'). By introducing a new dependency to previously independent product attributes (the procedure applied by the attribute dependency template), a product developer can come up with a Dijon Mayonnaise, in which a mayonnaise ingredient (i.e. mustard) is related to the region of origin of the ingredient (Dijon). The *replacement* template is based on the replacement of an essential component of the product by something in the immediate environment of the product that can fulfil the same necessary function. An example is a keyboard of a portable computer which transforms mechanical energy (from the user's fingers) to charge the battery. In this example, the battery in the product (an essential component) is replaced by a more beneficial system that draws on the user in providing the necessary energy. An example in food products could be the first product which replaced sugar by an artificial sweetener which has the same function (sweetening of product) including other advantages, such as lowering the amount of calories of the product. Another example is a mayonnaise from which oil is removed and replaced by plant sterols. The plant sterols have the same function (giving structure and taste to product) including a new health advantage, which is lowering the serum cholesterol. The *component control* template involves creating a new link between a component in the internal environment of the product and a component in its external environment. An example is 3M's post-it notes, which can repeatedly be attached and removed from a table. Compared to ordinary notes, a new link is created between the note and the table, leading to new benefits. In the *displacement* template, an essential component is removed including its associated function. An often mentioned example is the first Sony walkman, where the recording device is removed from the cassette player, making it feasible to develop a smaller product that can be carried around. In the *division* template, a product component is split in two and each new component is made responsible for a new function. For example, the ingredients of a strong washing powder are split to produce two products, one regular and one strong for highly soiled laundry. Finally, the *multiplication* template involves making one or more copies of an existing product component and alters them in some important way. For example, think of the opening of a ketchup jar which is copied. This second opening made it possible to precisely dose the amount of ketchup.

### *Restricted scope*

The underlying assumption of many idea generation techniques is that generating ideas is most productive in an unrestricted way. For example, the most well-known idea generation technique brainstorming encourages creativity (amongst other) by creating an atmosphere in which there is deferral of judgments which stimulates participants to generate a large number and wide variety of ideas. It is believed that the more ideas produced, the greater the probability that a real original idea will emerge (e.g. Baker and Hart, 1999). However, it has been shown that it is important that idea generation takes place in a focused way. In particular, the usual variety of discussions held within a brainstorming group tends to interfere with a

person's ability to work in a productive way (Nijstad, Stroebe and Lodewijckx, 2003; Kerr and Tindale, 2004). The restrictive scope principle states that by limiting the search area of an issue inventive productivity will be enhanced. In contrast to idea generation techniques that lack a structured framework, the number of variables under consideration in applying the innovation templates approach is limited and this is believed to increase creativity.

#### *Function follow form*

The application of the template operators leads to new (virtual) product forms, which are then examined for consumer relevance and benefits. This examination for consumer relevant benefits can be done by experts or by means of consumer concept evaluation studies. Goldenberg et al. (2001) argue that this unusual sequence of steps (i.e. 'function follows form') in obtaining new product ideas is beneficial for the idea generation process itself. People are more likely to make creative discoveries when they analyze novel forms and then assess what consumer benefits they might possess, rather than when they try to create an optimal form solely on the basis of consumer-desired benefits (Finke, World and Smith, 1992). This contrasts the traditional sequence of steps, also known in design literature as 'form follows function' (e.g. Krishnan and Ulrich, 2001). Form is the set of product characteristics that make up the product. Function is the set of consumer-desired benefits that would be fulfilled by the product form. Take for example the Quality Function Deployment approach, which starts with identifying consumer-desired product attributes (Hauser and Clausing, 1988). Next, these attributes are systematically translated in measurable product characteristics.

#### ***Templates and market success***

Goldenberg and Mazursky (2002) argue that templates carry codes for the evolution of successful new products and that they can be exploited to generate a competitive advantage based on minimal a priori market information. Besides their claimed advantages in the idea generation process, Goldenberg, Lehmann and Mazursky (2001) conclude also, based on two studies, that templates significantly distinguish successful from failed new products in the marketplace. In the first study, a set of successful and unsuccessful products (from three categories: kitchen devices, garden tools and car devices) was collected from the Israeli patent office. A product was considered a failure when it was either totally rejected by the market or when its introduction was cancelled due to poor test market results. Each product was classified according to the templates by judges trained in template identification. The predictive power of the templates was assessed by a logistic regression analysis which indicated that a high proportion (88.6%) of the failures and successes could be predicted by the model. Of all 41 included successful products, 36 products were predicted to be successful based on their template-structure. Similarly, of all 29 included failed products, 26 products were predicted to be a failure based on their lack of template structure. The second study likewise assessed the predictive power of template variables, but also included other variables such as source-idea determinants and project-level determinants. A set of 127 detailed cases of successful and unsuccessful consumer products was collected (70 successes and 57

failures) from three different books using the same criteria of success and failure as in the first study. Two of these books described a large set of product failures, including some of the classic cases such as New Coke (Adler and Houghton, 1997; McMath and Forbes, 1998). One book describes 50 well-known successful inventions, such as post-it notes, disposable diaper and the Swiss army knife (Freeman and Golden, 1997). Interjudge agreement in classification of product templates was high ( $\alpha=0.89$ ). A logistic regression analysis indicated that most (81.9%) of the failures and successes can be predicted by the template and idea-source variables. Based on these results, the authors conclude that products that follow the template structure have a greater likelihood of success. Hence, in an attempt to replicate the findings of Goldenberg and colleagues in the context of food products, we hypothesize:

H1 Templates are recognisable patterns in food innovations

H2 Template-based food products are more successful on the market than food products that are not template-based

### ***Templates and product complexity and incongruity***

Goldenberg and Mazursky (2002) explain the higher likelihood of success of products that match the template structure by referring to the concepts of surface and structural similarities in predicting consumer reactions to new products. Products can be similar to other products at different levels of abstraction. If two products have *surface* similarity, also called superficial similarity, they look alike in terms of their attributes (e.g. a new food product has the same colour or shape as known existing products). In contrast, *structural* similarity refers to resemblance in the underlying systems of relations between attributes of the product or other relations (e.g. a new food product has a similar function as known existing products, such as reducing blood cholesterol). Goldenberg and Mazursky (2002) suggest that products with a template structure possess more structural, rather than surface similarities between the new product and existing consumer knowledge about closely related products. The concept of structural and surface similarity originates in the 'learning by analogy' literature. When two products are more or less similar at a structural level, consumers tend to remember and understand the product by *analogical learning* (Gregan-Paxton and Roedder John, 1997; Blanchette and Dunbar, 2000; Holyoak and Koh, 1987; Wharton et al., 1994; Kokinov and Petrov, 2001). Analogical learning involves the transfer of knowledge of a familiar domain (the base) to a novel domain (the target) as a function of the structural correspondence between the two (Gregan-Paxton et al., 2002). An important implication of this finding in the analogical learning literature could be that templates provide a relation comparison between the new product and other products that the consumer already knows. This implicitly provided structural similarity may produce analogical learning and in this way educate consumers to make sense of the new product.

This relates closely to recent research into consumers' perceptions of newness (Michaut, 2004). Michaut shows that perceived newness is not a one-dimensional construct, although it is regularly measured as such. Perceived newness is a two-dimensional construct: incongruity (perceptual newness) and complexity (conceptual newness). *Incongruity* between

the new product and products previously encountered is the contrast immediately perceived with products that were known before. It deals with the perception of surface properties of the stimulus and is mainly based on an affective reaction to the product (see also Springer, 2001). *Complexity* of a new product is the difficulty to comprehend and make sense of it, making this dimension of newness situated in the cognitive domain (see also Rogers, 1995; Alba and Hutchinson, 1987). These two dimensions each have a different effect on consumer acceptance of new products. The incongruity dimension does not require any deep information processing and can be managed by consumers at the 'perceptual processing' level. The complexity dimension of newness requires deep, effortful and conscious information processes of the consumer. These two dimensions show strong resemblance to Goldenberg's contention of surface versus structural similarities. Michaut (2004) argues that particularly complex products have difficulty in generating consumer acceptance due to lack of conceptual coherence with existing knowledge. If this is the case, we contend that the beneficial effect of a template match would predominantly be true for more complex new products. To reduce this complexity, new products require a logical (i.e. structural) link to existing knowledge. Although complexity is negative at first glance, we think that templates infer a logical meaning to the product. Faced with a new product, people try to remember a similar situation, match them up, reason and learn what the product can do for them (i.e. analogical learning). In contrast, we do not expect an effect of incongruity. Products which are congruent with existing products can easily be understood without extensive information processing. And although incongruent products do not require extensive information processing, they draw consumer interest and attention. As a result, products high or low in incongruity do not need an educational template-link to support consumers in making sense of a new product.

In summary, when a new food product is perceived as complex by consumers, the beneficial effect of template-match is higher than for new products not perceived as complex by consumers. Therefore, we expect that the positive advantage of template-based is highest for consumer perceived complex products. In contrast, the expected positive advantage of a template basis is not affected by the degree of perceived incongruity of the product. Hence:

- H3 The positive advantage of a template-basis is larger for food innovation perceived as complex than for food innovations not perceived as complex.
- H4 The positive advantage of a template-basis is not affected by the perceived incongruity of the food innovations.

### **6.3 Methodology**

Our hypotheses are tested on the basis of 103 new food products (FMCGs) introduced in the Dutch market in 2000 and recorded in an ACNielsen database. For these products we obtained expert data on the template origin and consumer data on perceived product complexity and incongruity. In addition, we have access to AC Nielsen data of market share at 2, 7 and 13 months after launch.

## ***Procedure and measures***

First, three experts trained in template identification separately assessed whether each product was template derived on the basis of the templates' definition by Goldenberg, Lehmann and Mazursky (2001). Training of the experts involved a two hour session in which the templates were explained and demonstrated with examples of existing products. The six templates are: attribute dependency, replacement, displacement, component control, multiplication, and division; and the option 'no template' was added. The experts were not exposed to market success data during the assessment of the products. The three experts had a good agreement regarding whether or not a product was template-based (90% agreement). When experts disagreed, products were subsequently discussed until agreement was reached. This resulted in the 103 products being assigned a template (44 products) or no template (59 products). A dummy variable template versus no template was created to dichotomize the total product set.

Second, consumer data on perceived product complexity and incongruity was obtained by a sample of thirty Dutch consumers between 18 and 55 years old. A small sample size was appropriate, as in this study, the primary unit of analysis is the product itself, rather than the consumer. The respondents evaluated the 103 products randomly presented as concepts, with a visual and text on a computer screen, as part of a larger task. Respondents rated three complexity items: complex, uncertain, puzzling. *Complex* was defined as 'it is difficult to figure out what this product is', *uncertain* was defined as 'I don't immediately know what to do with this product' and *puzzling* was defined as 'I don't know what to do with this product'. Respondents rated also three incongruity items: incongruent, surprise, change. *Congruent* (reversed item) was defined as 'this product is in line with existing products', *surprise* was defined as 'I'm surprised such a product exists' and *change* was defined as 'The product is different from the existing products I know'. The meaning of each item was clearly stated on a separate sheet next to the computer and respondents could refer to it at any time. Respondents rated these variables on a seven-point Likert-type scale from 1 (not at all) to 7 (very much). One of the thirty subjects was eliminated as he did not complete the task. Principal component analysis of the variables 'complex', 'uncertain' and 'puzzling' on the set of 103 products, demonstrated that these three variables load on the same factor. These variables also showed a good scale reliability ( $\alpha=0.83$ ). The same accounts for the principal component analysis of the variables 'congruent', 'surprise' and 'change', which showed reasonable scale reliability ( $\alpha=0.69$ ).

Component scores for each product were aggregated for subsequent analyses and a dummy variable was created on the basis of these scores (cut-off value = median score) in order to identify low complex products (52) versus high complex products (51). A similar procedure was applied to obtain a group of incongruent products (52) and congruent products (51).

Finally, market success data for these 103 products were provided by ACNielsen. Market share was measured at month 2 (initial market share), month 7 and month 13 following the launch. We included the second month after launch instead of the first month, as during the first month not all products are usually fully represented at the supermarket shelves.

## **Data analysis**

A repeated measures Analysis of Variance (ANOVA) procedure was applied to the market success data of months 2, 7, and 13 after launch. Month 2 was included instead of month 1 as products may be introduced during the course of an ACNielsen four week period. A separate ANOVA model was calculated because the incongruity and complexity variables correlate (correlation is 0.48). Dummy variables were created representing seven major product categories in the supermarket (yellow fats/spreads, dairy, snacks/soup, beer and soft drinks, meal components (sauce, rice) and ice-cream to account for differences in market share due to type of category. One small remaining category 'other products' (i.e. coffee, pet food and chocolate) was dropped from the analysis to serve as baseline category to prevent multicollinearity.

## **6.4 Results**

As the three experts who assessed the template origin had good agreement on whether a product was a template or not (90%) agreement, hypothesis 1 is confirmed. When taking into account agreement regarding which type of template was present in the products, agreement dropped to 69%. The two separate ANOVA models (table 6.1 and table 6.2) showed no difference between template and non-template based products ( $F(1,102) = 1.72, p=0.193$  and  $F(1,102) = 1.38, p=0.244$ ). Hence, contrary to hypothesis 2, template products do not perform better than products that are not template based.

A complexity main effect was found ( $F(1,102) = 3.78, p=0.055$ ), although this difference is only marginally significant (table 6.1). Table 6.3 shows that this indicates that high complexity products have a lower market share than low complexity products. In agreement with hypothesis 3, the two-way interaction between complexity and template was significant ( $F(1,102) = 4.37, p=0.039$ ). An examination of the means in figure 6.1 and table 6.3 shows that for low complex products, no difference exists between template-based products and products that are non-template-based. In contrast, for complex products being template-based is beneficial for market share.



**Table 6.1: Analysis of variance of market share on complexity and template basis of products**

	F	p
<i>Main effects</i>		
Repeated measures factor	0.31	0.580
Complexity	3.78	0.055
Template	1.72	0.193
<i>Two way interaction effect</i>		
Complexity * template	4.37	0.039
Repeated measures factor * template	5.13	0.026
Repeated measures factor * complexity	0.43	0.514
<i>Three way interaction effect</i>		
Repeated measures factor * template * complexity	1.60	0.209
<i>Dummy effect<sup>1</sup></i>		
Dummy category 1	2.16	0.145
Dummy category 2	0.35	0.557
Dummy category 3	3.80	0.054
Dummy category 4	0.00	0.997
Dummy category 5	2.55	0.114
Dummy category 6	11.18	0.001

<sup>1</sup> Dummy categories: 1=yellow fats/spreads, 2=dairy, 3=snacks/soup, 4=beer/softdrinks, 5=meal components (sauce, rice) and 6=ice-cream.

**Figure 6.1 Mean market share depending on template basis and perceived complexity of products at month 2, 7 and 13**

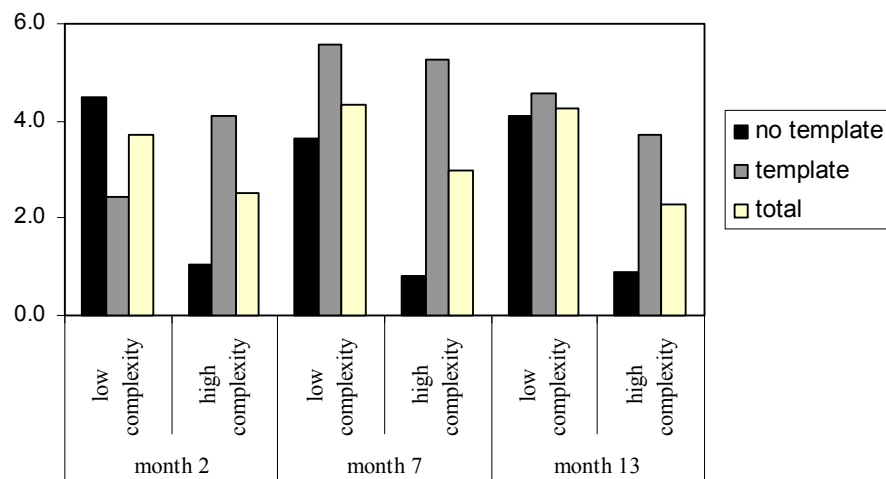


Table 6.2 and figure 6.2 show that there is no main incongruity effect ( $F(1,102) = 0.19$ ,  $p=0.664$ ), indicating that products that differ in being perceived as either high or low incongruent with existing products, do not differ in market shares. Hypothesis 4 states that the positive advantage of a template basis is not affected by the perceived incongruity of the food innovations. However, in contrast to our expectations, products perceived as highly incongruent have higher market shares when they are template-based as opposed to highly incongruent products not being template-based ( $F(1,102) = 4.59$ ,  $p=0.035$ ).

As a repeated measures ANOVA procedure was applied, table 6.1 and 6.2 also include the repeated measures factor. This factor shows whether there are significant differences between the three measurement points in time (month 2, 7 and 13). As can be seen in table 6.1 and 6.2, the interaction between the repeated measures factor and template-basis is the only significant ( $F(1,102) = 5.13$ ,  $p=0.026$  and  $F(1,102) = 4.59$ ,  $p=0.035$ ) factor, which indicates that the effect of template origin on market share differs over time.

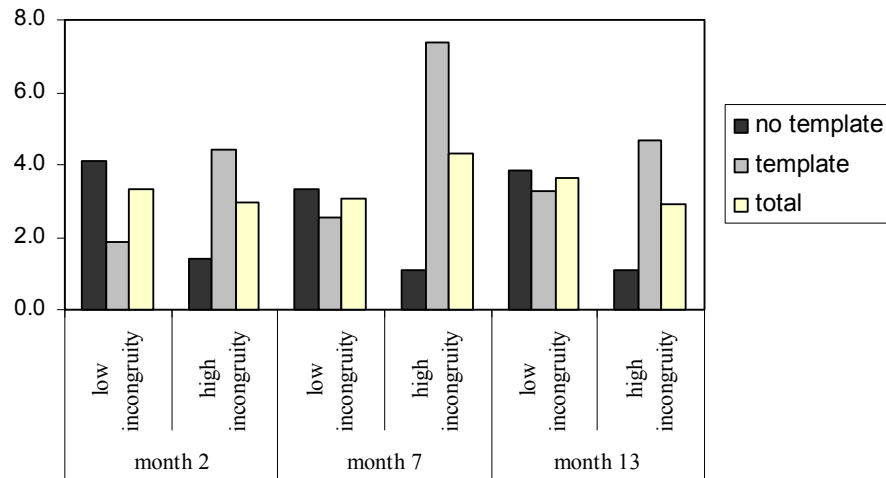
The dummy variable results in table 6.1 and 6.2 show that the product category ice-cream (category 6) has a significant effect on market share. In particular, the market share for ice-cream is significantly higher (on average 6.99) compared to, for example, the market share for dairy products (on average 2.02).

**Table 6.2: Analysis of variance of market share on incongruity and template basis of products**

	F	p
<i>Main effects</i>		
Repeated measures factor	0.54	0.464
Incongruity	0.19	0.664
Template	1.38	0.244
<i>Two way interaction effect</i>		
Incongruity * template	4.59	0.035
Repeated measures factor * template	4.01	0.048
Repeated measures factor * incongruity	3.60	0.061
<i>Three way interaction effect</i>		
Repeated measures factor * template * incongruity	1.41	0.238
<i>Dummy effect<sup>1</sup></i>		
Dummy category 1	1.31	0.255
Dummy category 2	0.01	0.942
Dummy category 3	3.11	0.081
Dummy category 4	0.00	0.977
Dummy category 5	0.91	0.341
Dummy category 6	6.02	0.016

<sup>1</sup> Dummy categories: 1=yellow fats/spreads, 2=dairy, 3=snacks/soup, 4=beer/softdrinks, 5=meal components (sauce, rice) and 6=ice-cream.

**Figure 6.2: Mean market share depending on template basis and perceived incongruity of products at month 2, 7 and 13**



**Table 6.3: Market share (mean and standard deviation) depending on complexity, incongruity and template origin of products at month 2, 7 and 13**

	template	N	Market share month 2	Market share month 7	Market share month 13
Total	no template	59	2.96 (3.75)	2.39 (3.33)	2.69 (3.86)
	template	44	3.37 (5.33)	5.41 (8.76)	4.09 (5.04)
	total	103	3.14 (4.47)	3.68 (6.39)	3.28 (4.44)
Low complexity	no template	33	4.49 (4.24)	3.64 (3.92)	4.10 (4.59)
	template	19	2.42 (2.56)	5.58 (8.10)	4.55 (5.36)
	total	52	3.73 (3.82)	4.35 (5.80)	4.27 (4.84)
High complexity	no template	26	1.03 (1.62)	0.81 (1.18)	0.89 (1.27)
	template	25	4.10 (6.69)	5.27 (9.38)	3.73 (4.86)
	total	51	2.53 (5.02)	3.00 (6.93)	2.29 (3.77)
Low incongruity	no template	34	4.11 (3.91)	3.34 (3.56)	3.86 (4.33)
	template	18	1.85 (1.52)	2.57 (2.15)	3.28 (4.40)
	total	52	3.33 (3.45)	3.07 (3.14)	3.66 (4.32)
High incongruity	no template	25	1.40 (2.92)	1.10 (2.52)	1.10 (2.38)
	template	26	4.43 (6.68)	7.37 (10.90)	4.65 (5.45)
	total	51	2.94 (5.36)	4.30 (8.52)	2.91 (4.56)

Although not tested for significant differences due to the small number of products, market share data for individual template types (table 6.4) shows that substantial differences in market share seem to exist between the different types of templates. Market share advantage appears to be mainly true for products based on the *attribute dependency*, and *replacement* templates. In contrast, products based on the templates *displacement*, *multiplication*,

*component control* and *division* show lower average market share than products which are not based on a template.

**Table 6.4: Average market share (mean and standard deviation) depending on type of template at month 2, 7 and 13**

	N	Market share month 2	Market share month 7	Market share month 13
total	103	3.14 (4.47)	3.68 (6.39)	3.28 (4.44)
no template	59	2.96 (3.75)	2.39 (3.33)	2.69 (3.86)
template	44	3.37 (5.33)	5.41 (8.76)	4.09 (5.04)
Attribute Dependency	13	5.22 (6.11)	10.08 (13.02)	6.93 (6.65)
Replacement	8	4.70 (9.38)	7.23 (9.60)	5.56 (6.38)
Multiplication	3	1.83 (0.82)	2.09 (2.78)	1.40 (1.74)
Division	10	1.44 (1.66)	1.77 (1.73)	1.30 (1.51)
Component Control	6	1.98 (1.10)	2.34 (1.20)	2.42 (1.11)
Displacement	4	2.81 (1.93)	2.91 (1.30)	3.39 (1.07)

## 6.5 Conclusions and discussion

The goal of this study was to understand whether templates have similar added value in FMCGs as in the product categories investigated by Goldenberg and colleagues (2001). This research aimed first of all to explore whether templates are recognizable in the FMCG category of foods (hypothesis 1). We found that innovation templates are recognizable in foods. The three experts largely agreed in assigning all products to either a template match or no template match category, indicating that the template structure can effectively be distinguished in foods. The experts, however, disagreed more about the type of template recognisable in an innovation, which suggests that sometimes more than one template can be distinguished in an innovation.

Our second hypothesis stated that being template-based results in better market performance. However, we did not find a positive effect of being template-based. This may result from the type of products included. We examined a set food products while Goldenberg and colleagues (2001) examined a sample consisting of products from different categories. Moreover, Goldenberg and colleagues examined a set of more extreme product cases, which were either a strong failure or success in the market place. Our products differed less dramatically in being a success or a failure in the market place, which could explain our dissimilar results.

Our third hypothesis builds on finding in the marketing literature that products perceived by consumers as highly complex at first glance holds a disadvantage in market performance when introduced in the market. First of all, a marginally negative effect of complexity on market performance ( $p=0.055$ ) was found, indicating that products perceived as complex tend to have lower market shares than products that are not perceived as complex at first sight. We assumed that products that match the template structure are able to overcome this

disadvantage. In line with our third hypothesis, we found that the advantage of a template match is highest for complex products compared to products with low perceived complexity.

Our fourth hypothesis states that incongruity does not interact with being template-based. In other words, the expectation was that the assumed beneficial effect of templates is not particularly true for products either low or high in perceived incongruity. However, results show that incongruity has a similar effect as complexity. In contrast to our expectations, we found that the advantage of a template match is highest for products with high perceived incongruity compared to products with low perceived incongruity. It could be that products perceived as highly incongruent are unfamiliar and difficult to recognize at first glance, which surprises consumers in an unpleasant way. Possibly, a template link makes them less dissimilar at the surface/perceptual level. This in turn helps them to get a higher market share.

It could be that new products that match the template structure may provide the optimal balance between structure and regularity on the one hand and surprise on the other. Future research could examine, for example, whether template-based products indeed possess structural similarities with existing knowledge, rather than surface similarities as put forward in our theoretical framework. In particular, it could be of interest to examine whether these structural similarities provided by the templates provide consumers with cues that trigger the formation of analogies with existing products. In this way, the template structure may facilitate consumer learning and acceptance of complex products.

It is important to point to some limitations of this study. First, the study is limited in the specific subset and number of products included. The products included are all survivors for at least one year. It might be fruitful to examine our hypotheses for a larger product set, which also includes products that fail within weeks or months after introduction. Second, in this study the median was used to split the sample of products in either high or low complex/incongruent. This is an arbitrary cut-off point which may not be similar to the real market place situation. Furthermore, the two dimensions of newness (complexity and incongruity) are correlated with each other. This could partly explain their similar effect on market share. Finally, Goldenberg and Mazursky (2002) state that 'templates are codes embedded in the product itself and in trends observed in its evolution'. As such, the structure of the templates may change over time or other, yet unknown, templates may evolve.

In sum, the templates can be used to channel the idea generation process into those types of ideas that have a higher probability of success or as an early screen for the likelihood of success. In particular, using templates to channel the idea generation or screening process into those types of ideas that have a higher probability of success seems specifically relevant for complex and incongruent products, but less relevant for simple ones. Moreover, when faced with a highly complex product, the consumer finds it difficult to make sense of the new product. Similarly, a highly incongruent product is too far away from what the consumer typically sees in the shop. The template structure might provide product managers with the opportunity to adapt a product to fit into one the template structures and hence in consumers' reference frame.



# Chapter 7

## General discussion

The aim of this thesis is to analyse key issues and develop and illustrate appropriate consumer research methodology at early stages of the NPD process, as this is one of the most distinguishing characteristics of successful NPD projects. In the first chapter, the importance of NPD is presented and key factors of success and failure of NPD performance are discussed. In the numerous studies of new product performance over the years, consensus has developed that understanding consumer needs is of greatest strategic value, especially in the early stages of the NPD process. During these early stages, the product has not yet been specified and the aim is to search for novel product ideas. Specially, the need for consumer research in the early stages is considered in the first chapter and criteria for effective strategic consumer research are outlined. The research reviewed in the introductory chapter provided a number of issues that needed further attention. In the subsequent chapters, these issues were dealt with. In this chapter, the main conclusions are summarized and research limitations and issues for further research are suggested.

### 7.1 Summary and conclusions

Chapter 2 (Van Kleef, Van Trijp and Luning, 2005a) deals with the problem that it is often difficult to select a consumer research method or technique in the early product development stages, especially for product developers from a (food) technological disciplinary background. Therefore, ten methods and techniques that are used most frequently to uncover unmet consumer needs and wants are critically reviewed. The contribution of this chapter is that it provides a comprehensive source of research methods and techniques for identifying new product opportunities from consumers. More importantly, it provides a framework for comparing the ten methods and techniques on the basis of three criteria that define the results obtained: information sources for need elicitation, task format and output actionability. Based on this framework, guidelines are offered for deciding which methods and techniques should be used in a particular product development situation. The conclusion is that the appropriateness of methods or techniques depends on the purpose for which they are implemented (support marketing versus support R&D) and the innovation strategy, which is pursued (winning in existing well-defined markets versus building a new market through

radically new products). Chapter 2 has been published as a discussion paper in *Food Quality and Preference* with commentaries from Wansink (2005), Garber and Boya (2005), Schmidt (2005) and Jaeger (2005).

Each of the following empirical chapters focuses on a specific aspect of the problems associated with selecting and implementing appropriate consumer research in the early stages of the NPD process. Table 7.1 summarizes the objectives, methods and major findings of the individual studies reported in chapter 3, 4, 5 and 6.

Chapter 3 (Van Kleef, Van Trijp and Luning, 2002) deals with the fact that successful NPD strongly depends on joint efforts from experts within the company and relevant consumer input from outside the company. Confirmative consumer research which tests new product concepts and in this way safeguards against unjustified investments are widely accepted, but often fall short in identifying new product ideas that deliver against consumer needs that are not yet fulfilled by products currently in the market. Therefore, this chapter focuses on the important pro-active role of consumer research in searching for new product opportunities by presenting an integrated approach towards idea generation and screening. The contribution of this study in chapter 3 is two-fold. First, the presented framework allows obtaining relevant consumer and expert feedback in an early stage of the NPD process. By systematically generating and rigorously screening a large set of product concepts both inside (experts) and outside (consumers) the company, the framework prevents that high potential opportunities are overlooked. This in turn provides a platform for product developers to discuss and decide upon which opportunities to pursue. The second contribution of this study is that by its illustration in the functional food context, it shows that experts and consumer disagree on a number of issues, showing the need for consumer research to prevent that new product opportunities are overlooked and new products fail in the market place.

Further, chapter 4 (Van Kleef, Van Trijp and Luning, 2005b) is devoted to the problem that food companies have many degrees of freedom in making managerial decisions in the early stages of the NPD process. This issue is examined in the context of functional food development. Functional food development is an interesting arena for this problem, as companies should decide on which health claim to focus on, through which food product the health benefit will be delivered and how exactly the health claim should be worded and communicated. The study extends previous work in this area in that it not only considers general rankings of consumer health concerns, preferred carriers or health claims, but in addition examines how the specific combination of health claim and carrier impacts consumer evaluation and how consumer responses to health claims are affected by alternative communication formats, namely whether the claim is defined in an enhanced function format versus a disease reduction format. A second contribution of this study is that it also looks into selective contextual (disease state) and personality (regulatory focus) determinants of health perceptions. The results show that consumer evaluations primarily differ to the extent that health claims are personally relevant in addressing an experienced disease state. Framing is important, but its effect differs by health benefit. No strong effects for consumers' regulatory focus were found.

Chapter 5 (Van Kleef, Van Trijp, and Luning, forthcoming) studies one particular success factor of consumer research in NPD, namely that information about consumer



perceptions and preferences should be actionable and appropriate for the task for which the end-user is responsible. The study provides a comprehensive conceptual and empirical comparison of internal and external preference analysis. It shows that both internal and external preference analysis emphasise fundamentally different, but complementary perspectives on the data. Internal preference analysis accounts better for consumer preferences and hence captures 'consumer understanding' while external preference analysis accounts better for perceptual or sensory information and hence captures 'product understanding'. In addition, external preference analysis shows stronger stability against the specific selection of products included in the study. Techniques like preference analysis are typically evaluated solely on their statistical performance. An important contribution of this study is that it includes the end-users perception of the value of preference analysis. In particular, it conceptualizes and measures the extent to which users perceive both techniques to be useful in terms of actionability for food technological, marketing and creative purposes. The results revealed that end-users find information from external analysis more actionable for food technological tasks. Internal preference analysis holds a clear advantage on marketing actionability and new product creativity. No preference technique holds a clear advantage on marketing-R&D interface appropriateness and comprehensibility. The results of this end-user study could support product developers in selecting the most appropriate preference analysis procedure.

The final empirical chapter in this thesis (chapter 6) studies different aspects of the innovation templates approach, which is recently introduced in the marketing literature. In recent years, it is increasingly argued that using ordinary consumers as a starting point in idea generation has serious drawbacks. Consumers find it difficult to express their needs and wants for products which are not yet in the market place. The innovation templates approach is built on the contention that to overcome this problem, companies should listen to 'the voice of the product' rather than the 'voice of the consumer' as a source of new product ideas. Innovation templates are a set of systematic operators which help to transform the product from an earlier version to a new version. The contribution of this study is two-fold. First, the study showed that innovation templates provide a recognisable structure in fast moving consumer goods and particularly for relatively low involvement products like foods. Second, it explored whether the templates enhance market success by examining actual market success rather than expert evaluation of new product ideas or historical analysis of new product survival. Although no positive overall effect of being template-based was found, a positive template effect was found for products with high perceived complexity and incongruity. This implies that innovation templates are particularly instrumental in enhancing market success of complex and incongruent (as opposed to more simple) innovations.

**Table 7.1: Summary of the objectives, study design and findings in chapters 3 till 6**

Chapter	Objectives	Study design	Key findings
3	Provides a framework that takes a structured and systematic approach to both concept generation and concept screening and analyses the extent to which experts' judgements are an accurate reflection of consumer demand.	Concept test in which systematically created mini-concepts were evaluated by consumers and experts.	Framework provides actionable and detailed diagnostic tool to be used in the search for new product opportunities. In addition, it shows that extent to which experts and consumers agree in their valuation of product concepts. It revealed that although correlation exists between functional food experts and consumers, there is considerable disagreement between experts and consumers in their valuation of certain subsets of mini-concepts.
4	Examines which health claim to claim, with which product category and which communication format. The study looks also into selective contextual (health status) and personality (regulatory focus) determinants of health claim evaluation.	Study 1: secondary analysis of consumer data collected for chapter 3. Study 2: consumer experiment	The results of the first study show that consumers tend to prefer functional food concepts that are personally relevant in addressing an experienced disease state in carriers with a healthy image or health positioning history. Framing effects differ by health claim. No strong effects for consumers' regulatory focus were found.
5	Identifies relative strengths and weaknesses of internal and external preference analysis regarding the techniques' ability to account for information (i.e. statistical content) and the extent to which their users perceive the methods as useful in terms of actionability for food technological, marketing and creative purposes.	Statistical comparison of internal and external preference analysis with preference data obtained from consumer panel and perceptual data obtained from trained expert panel. In addition, end-user panel evaluated resulting product maps on various aspects	<i>Internal preference analysis</i> accounts better for consumer preferences and holds a clear advantage on marketing actionability and new product creativity. In contrast, <i>external preference analysis</i> accounts better for perceptual or sensory information, shows stronger stability against the specific included selection of products and is perceived as more actionable for food technological tasks. No preference technique holds a clear advantage in terms of comprehensibility and being more or less appropriate for marketing or R&D professionals.
6	Examines whether innovation templates provide a recognisable structure in foods and whether product that follow template structure have higher market share than products who do not follow template structure. In addition, the hypothesis is tested that innovation templates are particularly instrumental in enhancing market success of complex (as opposed to more simple) innovations	Hypotheses are tested on the basis of market share data of 103 food products introduced in Dutch market. In addition, expert data on template origin and consumer data on perceived complexity and incongruity was collected.	Templates are recognizable structure in food products. No positive effect of template-origin was found over all products. Specifically, the advantage of a template match was found to be higher for products perceived as highly complex and incongruent as opposed to products not perceived as highly complex and incongruent.

## 7.2 Research limitations and issues for future research

The empirical studies in this thesis have a number of limitations, which are discussed in chapter 3, 4, 5 and 6. This section will identify the most important limitations. In addition, based on the findings in the empirical chapters, this section provides some advice regarding how future research could improve knowledge about consumer research in NPD.

First, more scientific research is needed, as the sample sizes in the reported studies are relatively small and selective. Extensions and replications of the studies to larger samples and other groups may further refine our findings.

Second, a limitation of this dissertation is that the studies are descriptive in nature and do not explicitly challenge the validity and reliability of consumer research methods. In his commentary on our discussion paper (Van Kleef, Van Trijp and Luning, 2005a), Cardello (2005) argues that many product developers are not likely to adopt consumer research methods, when reliability and validity are not firmly established. Unfortunately, the number of studies on the reliability and validity of consumer research methodologies for product development purposes that have been used in real-life product development situations is scarce. Especially qualitative research methodologies are often taken at face validity at best. One first direction for future research could be to test the validity of consumer research methodologies. This is a highly necessary, but at the same time an extremely difficult and costly undertaking. Overall, there is evidence that companies that explicitly and formally (method-based) look at consumer needs are more successful than companies that do not. For example, Hise, O'Neal, McNeal and Parasuraman (1989) show that companies that use a full range of up-front activities (e.g. market definition, identifying consumer needs) have a 73% success rate compared with a 29% success rate for companies that use only a few of the up-front activities. However, the ultimate test of validity would be a field experiment in which companies introduce new products at the market based on either a particular methodology or no methodology. Not many companies are willing to cooperate in such an experiment, although an exception is the study about the effectiveness of the lead user approach at 3M. In this study, Lilien, Morrison, Searls, Sonnack and Von Hippel (2002) compared the effectiveness of the lead user approach in a field setting against conventional procedures used by teams in the same setting. Their study showed that forecast annual sales of lead user product ideas are more than eight times higher than forecast sales for ideas resulting from the 'traditional' methods.

This raises the important issue what can be done to facilitate the use of more consumer research methods. Consumer research is a means to an end and not an end in itself. Therefore, it is of crucial importance to understand how product developers make decisions under different product development circumstances. Better awareness of the critical knowledge that is needed by people from different functional backgrounds may help to develop new or improved methods for consumer research in NPD. The introductory chapter and the review in chapter 2 referred to studies that showed that although many consumer research methods are available, they are not commonly used. This could occur because product developers with different functional backgrounds often have diverse consumer research needs and expectations. Consumer research methods appropriate for the early

stages of the NPD process need to improve in that they provide actionable and appropriate information to the people that must use the findings. For example, results of chapter 4 showed that internal preference analysis was more preferred for creative tasks (typically carried out by marketing professionals), while external preference analysis was more preferred for (among others) food technological tasks (typically carried out by R&D professionals). This cross-functional nature of the NPD process has significant implications for consumer research. In other words, an important future research task is to take the end-user value perception into account when developing or improving consumer research methodologies.

Third, another reason why many methods and techniques are not more commonly used in NPD is that marketing and R&D professionals each have a very different focus in consumer research validity (see also Van Trijp and Schifferstein, 1995). To a large extent this touches on the issue of internal versus external validity problems. Specifically, R&D efforts tend to be focused on internal validity, which is whether a study has generated valid findings about individual objects which have been studied. This is generally the core focus from a product-oriented / physical science point of view. It is evidenced by the controlled experimental type of designs close to the realm of the physical product. Although these behavioural food studies have made huge progression in including assessments of “true” consumers, the research contexts have been largely controlled in terms of the stimulus, the context and the measurement procedures being adopted (see Schutz, 1988; Cardello and Schutz, 1996). Such designs are very effective when it comes to tracing back consumer responses to variations in the physical product. However, it remains questionable to what extent these findings generalize to ‘real life’ consumer behaviour. Consumer researchers, particularly those from a marketing perspective are often more concerned with the external validity, which is whether study findings can be generalized to the potential consumer clientele. Focus on internal versus external validity does not easily co-exist. Complementary perspectives which attempt to address both internal and external validity seem warranted here, and also as a means of overcoming communication difficulties between marketing and R&D (e.g. Cooper, Edgett and Kleinschmidt, 2004). This also implies that more than one method or technique is needed in the early stages of the NPD process to meet the needs of different types of users.

Finally, as indicated in previous chapters (e.g. introductory chapter 1), product success rates continue to be extremely low and little improvement can be seen over time. Consequently, a consumer-orientation in NPD will continue to be extremely important in the future. The challenge is to continuously generate new knowledge about consumer needs and how to best satisfy them (Slater and Narver, 1998; Narver and Slater, 2000). Of special importance in the design and improvement of consumer research methods for NPD is the ability to provide guidance in the development of really new products and not just line extensions and incremental improvements to existing products. This kind of research is the most challenging, but ultimately may yield the greatest payoff. In particular, this kind of research should support the elicitation of latent and emergent needs. Wind and Mahajan (1997) argue that most consumer research methods focus on continuous innovations in predictable markets. Although this kind of research may provide valuable input in the NPD process, consumer research should become pro-active and focus on overcoming the problems of ordinary consumers having difficulty expressing their future needs. In particular, Wind and

Mahajan (1997) argue that new research approaches are required that avoid consumers' short-term and current experience bias and enable them to identify their true needs and wants as they may involve under future scenarios. The information acceleration method (Urban, Weinberg and Hauser, 1996) is an important example of a method, which educates respondents on the capabilities of really new products in a virtual reality. It could be expected that the fast developing information technologies and the internet may contribute to better and faster collecting and collating consumer data and transforming this into useful knowledge.

Notwithstanding these limitations, the present thesis filled in a number of gaps in existing knowledge regarding the effective development and use of consumer research in the early stages of the NPD process. By providing a more comprehensive understanding of key aspects of successful consumer research for the early NPD process, this thesis hopefully stimulates further research in this interesting area.



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# Samenvatting (summary)

Nieuwe producten die voor consumenten een herkenbare toegevoegde waarde hebben dragen substantieel bij aan het succes van ondernemingen. Het ontwikkelen van nieuwe producten is voor ondernemingen daarom een noodzakelijke, maar tegelijkertijd ook een riskante activiteit aangezien veel nieuwe producten falen. Er is veel onderzoek gedaan naar de redenen van succes en falen van nieuwe producten. Het begrijpen van en afstemmen op consumentenbehoeften blijkt van grote strategische waarde te zijn voor succes in productontwikkeling, vooral als dit consumentenonderzoek in een vroeg stadium (het zogenaamde fuzzy front end) van het ontwikkelingsproces wordt uitgevoerd. Juist in deze vroege fase levert consumentenonderzoek een belangrijke bijdrage, omdat het nieuwe product dan nog niet exact gedefinieerd is en consumentenonderzoek kan helpen om kansrijke vernieuwende productideeën te identificeren, te optimaliseren en initieel te valideren. Vele methoden voor consumentenonderzoek in de vroege fasen van productontwikkeling zijn beschikbaar. Een probleem is dat deze methoden in de praktijk van het productontwikkelingsproces niet algemeen geaccepteerd en gebruikt worden. Redenen die hieraan ten grondslag liggen zijn onder andere dat consumentenonderzoek door andere disciplines niet altijd als geloofwaardig en behulpzaam wordt gezien bij het genereren van innovatieve productideeën. Verder bestaat de angst dat consumentenonderzoek het productontwikkelingsproces onnodig kan vertragen, de input moeilijk te begrijpen is, en de resultaten door de eindgebruiker vaak niet gezien worden als direct inpasbaar in de productontwikkelingstaak.

Consumentenonderzoek in een vroeg stadium van het productontwikkelingsproces is het centrale thema van dit proefschrift. Het doel van dit proefschrift is om belangrijke aspecten van dit thema te benoemen en te analyseren en om (nieuwe) methoden van consumentenonderzoek in de vroege fasen van productontwikkeling te identificeren en te illustreren. Consumentenonderzoek kan op een bevestigende manier worden ingezet in het productontwikkelingsproces, door bijvoorbeeld nieuwe ideeën, concepten of prototypes uitgebreid te testen voordat tot lancering wordt overgegaan. Hierdoor worden risico's op falen gereduceerd. Consumentenonderzoek kan ook worden uitgevoerd om inspiratie te krijgen en kansen te identificeren in de vroege, creatieve, fase van het ontwikkelingsproces. Hiermee zorgt een onderneming ervoor dat kansrijke concepten niet over het hoofd worden gezien. Succesvolle productontwikkeling vereist een balans tussen beiden typen onderzoek.

Het onderzoek in dit proefschrift richt zich op het optimaal inzetten van deze beide typen consumentenonderzoek in een vroeg stadium van het productontwikkelingsproces. Hierbij gaat de aandacht uit naar methoden die behulpzaam zijn bij het genereren en valideren van productconcepten. Hoofdstuk 2 omvat een literatuuronderzoek en classificatie van methoden en technieken voor consumentenonderzoek in de vroege fasen van het productontwikkelingsproces. Hoofdstuk 3 illustreert een methode om op systematische wijze een grote set van productconcepten te genereren en te screenen waarbij kennis van de consument en andere (technische) disciplines gecombineerd wordt en laat het belang zien van het meewegen van de "stem van de consument" in de keuze van kansrijke concepten. Hoofdstuk 4 illustreert de problematiek voor een kansrijke ontwikkeling binnen food innovatie: namelijk die van functionele voedingsmiddelen. Het hoofdstuk geeft inzicht in een aantal strategische beslissingen ten aanzien van functionele voedingsmiddelen die al in een vroeg stadium van productontwikkeling genomen moeten worden ten aanzien van claim formulering, doelgroepbepaling en productkeuze. Methoden voor consumentenonderzoek zijn geen doel op zich maar een hulpmiddel voor eindgebruikers van de informatie die dit soort onderzoek oplevert. Hoofdstuk 5 past deze gedachte toe in de evaluatie van twee veelgebruikte preferentie technieken. Deze worden niet alleen op statistische criteria, maar ook op overwegingen van de eindgebruiker vergeleken. Hoofdstuk 6 gaat in op een relatief nieuwe methode (de innovatie templates methode) voor het genereren van ideeën en concepten en de meerwaarde die deze methode kan hebben in het genereren en screenen van succesvolle productconcepten.

Hoofdstuk 2 (Van Kleef, Van Trijp en Luning, 2005a) begint met een kritische bespreking van tien algemene methoden voor consumentenonderzoek in vroege fasen van het productontwikkelingsproces. Het hoofdstuk biedt een uitgebreid overzicht van methoden en technieken om kansen voor nieuwe productconcepten te identificeren. Een belangrijke bijdrage van dit hoofdstuk ligt in de ontwikkeling van een classificatieschema dat de bruikbaarheid van deze methoden en technieken systematisch in kaart brengt. De dimensies van dit classificatieschema zijn: (1) de stimuli die gebruikt worden als uitgangspunt om consumentenbehoeften te begrijpen, (2) de werkwijze van methode en (3) de relevantie van de uitkomsten voor de eindgebruiker van de methode. Op basis van de classificatie van methoden worden richtlijnen gegeven voor hun geschiktheid in een vroeg stadium van het productontwikkelingsproces. De conclusie van dit hoofdstuk is dat de geschiktheid van een methode afhangt van het doel waarvoor de methode wordt ingezet (ondersteuning van marketing of R&D) en de innovatie strategie die wordt nagestreefd (optimalisatie van bestaande producten of ontwikkelen van zeer nieuwe producten).

Hoofdstuk 3 (Van Kleef, Van Trijp en Luning, 2002) neemt als uitgangspunt dat succesvolle innovatie in de voedingsmiddelenindustrie haar oorsprong kan hebben zowel in superieur begrip van consumenten als ook in superieur begrip van de mogelijkheden en kansen die wetenschap en technologie bieden. In beide gevallen hangt marktsucces af van de mate waarin de onderneming met het nieuwe product op onderscheidende wijze tegemoet komt aan, tot dan toe onvervulde, consumentenbehoeften. Hoofdstuk 3 past deze uitgangspunten

toe in een onderzoekskader voor de identificatie van mogelijkheden met functionele voedingsmiddelen zowel vanuit het perspectief van experts als vanuit consumenten. De voorgestelde methode behelst het systematisch genereren en screenen van een grote set van mogelijke concepten voor functionele voedingsmiddelen. Hierin worden competenties binnen (functionele voedingsmiddelenexperts) en buiten de onderneming (consumenten) betrokken om zo zeker te stellen dat concepten met veel potentieel niet over het hoofd worden gezien. Het onderzoekskader biedt verder een platform voor productontwikkelaars om te discussiëren en te beslissen welke concepten kansen bieden. De illustratie van het onderzoekskader laat de mate zien waarin expert-oordelen een accurate weergave zijn van consumentenbehoeften. Het onderzoek laat zien dat hoewel er overeenkomsten zijn tussen experts op het gebied van functionele voedingsmiddelen en consumenten, beide groepen het ook vaak oneens zijn in hun waardering voor bepaalde productconcepten.

Functionele voedingsmiddelen vormen een belangrijke ontwikkelingsrichting binnen de voedingsmiddelenindustrie. Bij de ontwikkeling van dit type voedingsmiddelen moet een aantal strategische beslissingen genomen worden zoals welke gezondheidsvoordelen te claimen, met welk product (categorie) en in welk communicatie format. Hoofdstuk 4 (Van Kleef, Van Trijp en Luning, 2005b) rapporteert twee studies die tot doel hebben om een aantal van deze beslissingen te systematiseren. De eerste exploratieve studie is een secundaire analyse van tien verschillende gezondheidsclaims die systematisch gecombineerd zijn met tien verschillende voedingsmiddelen om te evalueren hoe beslissingen ten aanzien van claim en carrier gezamenlijk de geschiktheid bepalen van functionele voedingsmiddelen positionering. De resultaten laten zien dat consumenten een voorkeur hebben voor concepten die ziekte-gerelateerde gezondheidsvoordelen beschikbaar maken via voedingsmiddelen met een gezond imago of een historische gezondheidspositionering. De tweede studie onderzoekt de optimale formulering van gezondheidsclaims door systematisch te variëren in de manier waarop specifieke gezondheidsclaims kunnen worden gecommuniceerd naar de consument. Twee fysiologisch georiënteerde claims (hartziekten en osteoporosis) en twee psychologisch georiënteerde claims (stress en gebrek aan energie) zijn weergegeven in een 'versterkte functie'-formulering of een 'ziekte risico reductie' formulering. Verder zijn in deze studie de consumentenkenmerken 'promotie/preventie motivatie' en gezondheidsstatus van de respondent meegenomen om te achterhalen hoe deze factoren gezondheidsclaim evaluatie beïnvloeden. De resultaten laten zien dat consumentenevaluaties van gezondheidsclaims vooral bepaald worden door de mate waarin ze relevant zijn voor ziekten die de consument persoonlijk ervaart. De manier waarop een gezondheidsclaim wordt geformuleerd is van belang, maar het effect verschilt per gezondheidsvoordeel. Zo hebben consumenten een voorkeur voor 'versterkte functie' claims als het gaat om energiegerelateerde gezondheidsvoordelen en hebben 'risico reductie' claims een voorkeur als het gaat om gezondheidsvoordelen met betrekking tot hart en vaatziekten. Promotie/preventie motivatie blijkt slechts een zeer gering effect op gezondheidsclaim evaluatie te hebben. In de discussie sectie worden mogelijke verklarende mechanismen aangedragen en worden de implicaties voor de ontwikkeling van functionele voedingsmiddelen besproken.

Hoofdstuk 5 (Van Kleef, Van Trijp en Luning, in druk) vergelijkt twee populaire consumentenmethoden in de vroege fasen van het productontwikkelingsproces op conceptueel en empirisch niveau: interne en externe preferentieanalyse. Naast een systematische vergelijking op statistische criteria worden de methoden ook vergeleken op de mate waarin eindgebruikers de resultaten van deze methoden nuttig en bruikbaar achten. De eindconclusie van deze studie is dat interne en externe preferentie analyse fundamenteel verschillende, maar complementaire perspectieven, op de data weergeven. Interne preferentie analyse verklaart consumentenvoorkeuren beter en levert daarom voornamelijk 'consumentenbegrip' op terwijl externe preferentie analyse perceptuele of sensorische data beter verklaart en primair gericht is op 'product kennis'. Externe preferentie analyse laat een hogere stabiliteit zien en is minder gevoelig voor de specifieke selectie van producten die in de studie worden opgenomen. De resultaten laten verder zien dat eindgebruikers informatie van externe preferentie analyse meer geschikt vinden als input voor levensmiddelentechnologische taken. Interne preferentie analyse wordt gezien als meer geschikt voor marketing taken en nieuwe product creativiteit. Geen van beide technieken wordt door eindgebruikers als meer of minder geschikt gezien voor de marketing/R&D interface of als meer of minder begrijpelijk. In plaats van aan te bevelen om beide technieken toe te passen, worden in hoofdstuk 5 verschillende manieren bediscussieerd om een betere synergie tussen beide technieken te realiseren.

Het laatste empirische hoofdstuk in dit proefschrift (hoofdstuk 6) richt zich op verschillende aspecten van de recent in de marketing literatuur geïntroduceerde innovatie templates methode. In toenemende mate wordt binnen de marketing literatuur benadrukt dat het gebruik van 'gewone' consumenten als bron voor idee generatie een aantal serieuze beperkingen kent. Consumenten vinden het moeilijk om behoeften te verwoorden voor producten die ze nog niet kennen c.q. die nog niet verkrijgbaar zijn. De innovatie templates methode heeft als uitgangspunt dat ondernemingen beter naar 'de stem van het product' dan naar 'de stem van de consument' kunnen luisteren als bron van nieuwe productideeën. Innovatie templates zijn een set van systematische operatoren die helpen een product te transformeren van een eerdere versie naar een nieuwe versie. De studie in dit hoofdstuk laat zien dat innovatie templates herkenbaar zijn in voedingsmiddelen. Eveneens is onderzocht of de templates leiden tot groter marktsucces. Hiertoe wordt marktsucces uitgedrukt in werkelijke marktaandeelen in plaats van, zoals meer gebruikelijk, in expert oordelen over marktsucces. Er wordt geen hoofdeffect voor het gebruik van templates als predictor van marktsucces gevonden. Templates doen hun effect of marktsucces gelden in interactie met de mate van productnieuwheid, zowel de incongruiteit van het product als de complexiteit van het product. Dit houdt in dat de innovatie templates voornamelijk instrumenteel zijn in het verbeteren van marktsucces van complexe en incongruente (in tegenstelling tot meer simpele) innovaties.

In hoofdstuk 7 worden de gevonden resultaten uit de voorgaande hoofdstukken samengevat. Eveneens worden in dit afsluitende hoofdstuk beperkingen van dit proefschrift weergegeven. Een beperking van de studies die in dit proefschrift gerapporteerd worden is ondermeer dat de studies beschrijvend van aard zijn en niet expliciet de validiteit en betrouwbaarheid van

consumenten onderzoeksmethoden kwantificeren. Een eerste aanbeveling voor toekomstig onderzoek is dan ook het testen van de validiteit van consumentenonderzoek methoden. Bovendien wordt ingegaan op de vraag hoe het gebruik van consumentenonderzoek kan worden vergemakkelijkt. Consumentenonderzoek is een middel en niet een doel in zichzelf. Het is daarom van cruciaal belang dat beter wordt begrepen hoe productontwikkelaars beslissingen nemen in verschillende omstandigheden. Bovendien hebben marketing en R&D productontwikkelaars elk een verschillende focus op het type informatie dat ze zoeken vanuit consumentenonderzoek. Eindgebruiker-evaluaties en percepties kunnen behulpzaam zijn in het optimaliseren van bestaande methoden of het ontwikkelen van nieuwe methoden. Als onderwerp voor verder onderzoek wordt genoemd het ontwikkelen en verbeteren van consumentenonderzoek voor zeer nieuwe producten. Veel onderzoeksmethoden richten zich op continue innovaties in voorspelbare markten. Hoewel dit waardevolle input levert voor productontwikkeling, zijn het juist de echt nieuwe producten die de meeste winst opleveren. De verdere ontwikkeling van onderzoeksmethoden die behulpzaam zijn in het achterhalen van latente behoeften van consumenten is daarom van groot belang.



# Curriculum Vitae

Ellen van Kleef was born in Echteld, the Netherlands, on October 19, 1972. She finished her secondary education (H.A.V.O.) at the Christelijk Lyceum Veenendaal in 1990, after which she started the bachelor's education 'Nutrition and Dietetics' at Hogeschool Nijmegen. After graduation in 1994, she went to Wageningen University to study 'Human Nutrition'. She obtained a Master of Science degree in 1997 after completing a master thesis on new product development at the Marketing and Consumer Behaviour group. After working for a short period of time at Unilever Research Vlaardingen (1998), she began her doctoral dissertation research at Wageningen University in 1999. The results of this research are described in this thesis. Since April 2004, she has been a postdoctoral researcher at the EU-funded research project SAFE FOODS (Promoting food safety through a new integrated risk analysis approach for foods). Her main research interests cover various topics in consumer behaviour and marketing, including new product development and consumers' risk perceptions and behaviours in relation to food safety.





# Training and supervision plan

## Discipline specific activities

### Courses

- Netherlands Organisation for Business Economics and Management (NOBEM) / Landelijk Netwerk Bedrijfseconomie (LNBE): Marketing Management, 2001
- Mansholt Graduate school: Multidisciplinary course Chain Responsiveness and the new Economy, 2001
- Netherlands Organisation for Business Economics and Management (NOBEM) / Landelijk Netwerk Bedrijfseconomie (LNBE): Research Methodology, 2000

### *Presentations at meetings and international conferences*

- 33<sup>rd</sup> European Marketing Academy (EMAC) conference, Murcia-Spain, 2004
- Marketing Information Event van Marktonderzoek Associatie (MOA) en Nederlands Instituut voor Marketing (NIMA), Rotterdam- The Netherlands, 2003
- Graduate School VLAG, 32<sup>nd</sup> Thematic meeting 'consumer-oriented food product design', Wageningen- The Netherlands, 2003
- Research seminar WUR/TU Delft on new product development, Delft-The Netherlands, 2003
- Werkgroep Voedingsgewoonten (WEVO), Utrecht - The Netherlands, 2002
- Intensive Programme 'Novel and functional foods', Warsaw-Poland, 2002
- 13<sup>th</sup> European Marketing Academy (EMAC) colloquium for doctoral students in marketing, Rotterdam- The Netherlands, 2000
- Internal research seminars Marketing and Consumer Behaviour group and Product Design and Quality Management group, 2001 and 2002

**General courses**

- Mansholt Graduate school: Writing and presenting a scientific paper, 2002
- Wageningen University Language Centre: English Upper-intermediate, 2001

**Optionals**

- Preparation PhD research proposal











