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Review

An overview of means-end theory: potential application in consumer-oriented food product design

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This paper presents an overview of the means-end chain theory and associated techniques, and discusses the virtues and shortcomings of its potential application in consumer-oriented food product design. This overview, based on literature in the food area, presents also the process of conducting a means-end study by drawing on previous research on consumers' motivations regarding meal choice. Finally, the usefulness of means-end studies in the context of consumer-oriented food product design is evaluated and future research trends in this area are discussed.

Introduction

Consumer-oriented food product design is a market-based innovation concept, which focuses on the use of consumers' current and future needs, as well as its determinants, in the design of innovative and/or improved food products with added value (Grunert, Baadsgaard, Larsen, & Madsen, 1996; van Trijp & Steenkamp, 1998). The key stages in the formulation of this concept are: *need identification*, *idea development* to fulfil the need, *product development* to substantiate the idea and the product's *market introduction*, communicating the fulfilment of the need (Urban & Hauser, 1993) (Fig. 1). Central here is the ability to "translate" the subjective consumer needs (e.g. healthy, convenient) into objective product specifications, in order to, through the creation of the core product, substantiate the fulfilment of these needs. Concurrently, another type of "translation" is employed in the development of a positioning and a communication strategy for the new product, which can clearly communicate the benefits delivered and, thus, the satisfaction of consumer needs in a distinctive and superior way.

It has been suggested in academic literature that the means-end chain theory (MEC) (Gutman, 1982; Olson & Reynolds, 2001) could be a relevant way of putting consumer-oriented food product design into practice (Audenaert & Steenkamp, 1997; Grunert & Valli, 2001; ter Hofstede, Steenkamp, & Wedel, 1999). MEC is said to provide a better understanding of potential food consumption motives by depicting how concrete product attributes are linked to self-relevant consequences of consumption and personal life values (or goals), in a hierarchical model of consumers' cognitive structures. In essence, this approach is thought to be able to identify the choice criteria used by consumers to evaluate and select among alternative products or services, and explain the higher-order reasons leading to the salience of these particular criteria (Grunert & Valli, 2001; Olson & Reynolds, 2001). MEC's main assumption is that people do not buy products for the products' sake, but for the benefits that their consumption can provide. That is, the utility of a product is not so much in its features, but in the functional and psychological consequences it delivers, which are in turn important for the realisation of consumers' goals and values. A similar assumption underlies the concept of consumer-oriented

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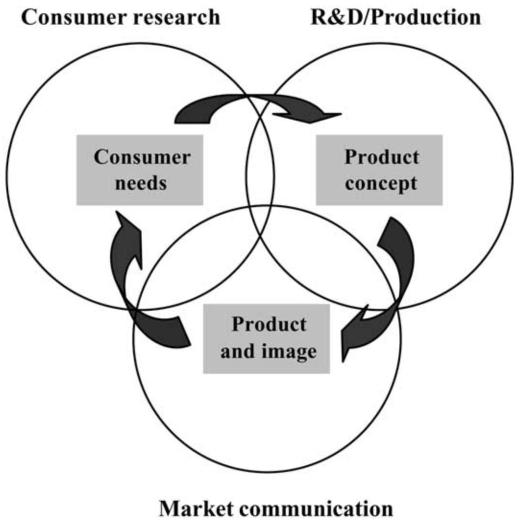

Fig. 1. The consumer-oriented new product design concept.

food product design. According to it, new foods and their production technologies should not in themselves be seen as the goal or end of the design process, but rather as a means of fulfilling needs, thereby facilitating the achievement of consumers' values and goals (van Trijp & Steenkamp, 1998).

It has been proposed that MEC can improve the actionability of consumer-oriented food product design by providing, in an integrated manner, three types of useful information about consumers (Audenaert & Steenkamp, 1997; Grunert & Valli, 2001; Gutman, 1982; ter Hofstede *et al*., 1999; van Trijp & Steenkamp, 1998):

- The key benefits consumers expect from foods (i.e., the consumer needs), which can be used to establish the positioning of new products in the marketplace;
- The concrete and abstract product features consumers use to infer the delivery of key benefits (or the absence of negative outcomes or risks) associated with consumption, which can provide guidance to R&D efforts;
- The values and goals establishing the relevance of the different benefits for consumers, which can be used to design and target advertising campaigns communicating about the new product.

By increasing the dissemination and use of relevant consumer information across organisational functions, MEC is said to help improve the level of co-ordination between R&D and Marketing. Consequently, the likelihood of success of new product development (NPD) processes is also improved (Griffin & Hauser, 1996; Søndergaard, 2002; ter Hofstede *et al*., 1999).

The aim of this paper is to present an overview of MEC and associated techniques, and discuss the virtues and shortcomings of its potential application in consumer-oriented food product design. The paper starts with a description of MEC main assumptions and the techniques that lead to its implementation. We restrict ourselves to issues that are relevant to food products and their design, using examples drawn from food-related literature whenever possible. The process of conducting a MEC study, from data collection to analysis and outcome, is exemplified through the description of a study uncovering consumers' motivations regarding meal choice (Costa, Schoolmeester, Dekker & Jongen, 2003a). Finally, the usefulness of MEC studies in the framework of a consumer-oriented food product design is evaluated and future research trends in this area are discussed.

The means-end chain theory and associated techniques

Main aspects of the means-end chain theory

Conceptually, MEC views consumers as goal-oriented decision-makers, who choose to perform behaviours that seem most likely to lead to desired outcomes. Two general assumptions are relevant in this goal-oriented framework. The first is that consumers buy and use products depending on their evaluation of the self-relevant consequences of these behaviours. They establish the self-relevance of the consequences based on individually held values, while inferring their valuation from the products' attributes. These attributes, consequences and values (ACV) and, above all, the links consumers establish between them, constitute the essence of MEC. The second assumption has to do with the level of intent and awareness of consumption-related behavioural decisions. Consumers are assumed to make voluntary and conscious choices between alternative objects, which are guided by the search of positive consequences and/or the avoidance of negative outcomes (Olson & Reynolds, 2001). Food- and meal-related decision-making is, however, known to be highly influenced by habitual, symbolic and emotional aspects, as well as characterised by a relatively low level of involvement[1] (Costa, Schoolmeester, Dekker & Jongen, 2003b; Grunert *et al*., 1996; Steenkamp, 1997). By uncovering the way attributes, consequences and values are linked in consumption decision-making, MEC can nevertheless shed light into how automatic, unconscious or emotional-based decision-making comes to being (Olson & Reynolds, 2001). It is thus assumed to accommodate well emotional and less conscious food consumption aspects and to produce satisfactory results even with low involvement products (Grunert, Grunert, & Sørensen, 1995; Nielsen, Bech-Larsen, & Grunert, 1998).

[1] Though one could argue that meal choice is probably characterised by a higher level of involvement than the choice of individual foods. This is due to the high personal relevance conferred by the socio-cultural, functional and financial valuations of meals (Meiselmann, 2000; van Trijp & Meulenberg, 1996).

The original development and application of MEC took place in the areas of marketing and advertising research (Gutman, 1982), and was recently revised by Olson and Reynolds (2001). Meanwhile, two alternative views of this theory have arisen: the classic, motivational perspective, advocated by Olson and Reynolds (2001), and the more ambitious, cognitive-structure view taken by Grunert and Grunert (1995). The classic view is concerned with obtaining qualitative insights into consumers' consumption motives in specific situations. The usefulness of this approach can be evaluated by the extent to which its users feel they have achieved a better understanding of consumers' decision-making processes. Means-end chains can also be seen, however, as models of consumption-relevant cognitive structures, that is, of the way consumers store and organise consumption-related knowledge in their memory. It should be possible, using such an approach, to predict consumption behaviour by specifying, in a given situation, which parts of the cognitive structure are activated to guide decisions and how they connect to the actual decision-making. The criterion for the evaluation of an application of this kind of approach would then be the predictive ability of the uncovered cognitive structures (Grunert *et al.*, 1995). Given the current low level of knowledge regarding the predictive ability of means-end chains, food-related studies (mostly of an exploratory character) have primarily opted for the motivational approach. It is nevertheless advisable that in a MEC application study both the empirical procedures and the analysis of results are carried out in a way that promotes the evaluation of the study's predictive ability. In the following sub-sections it is proposed how this can be best achieved.

Issues involved in the design of a MEC application study and the performance of laddering interviews

The most usual research application of MEC consists in a set of methods for interviewing consumers about the motivations behind their choices and interpreting these interviews in terms of the linkages between its outcomes (Olson & Reynolds, 2001). The interview method supported by the motivational approach is the so-called *laddering technique*, which was originally developed by Hinkle (1965) (Grunert & Grunert, 1995; Reynolds & Gutman, 2001, 1988, 1985). Laddering interviews are face-to-face, individual, in-depth, semi-structured interviews aiming at the elicitation of the attribute-consequence-value associations consumers hold regarding the object(s) under study. They consist of two stages: firstly, an elicitation technique prompts subjects to generate relevant attributes associated with the object(s), and secondly, through a series of probing questions, subjects expose why these attributes are relevant in terms of related consequences and values.

The collection of the relevant attributes associated with the object of study is achieved through the elicitation of the distinctions made by each subject. These distinctions concern perceived meaningful differences between the object of study and alternative objects in the same context. The elicitation procedure is rather important for the outcome of a laddering study, since it determines the relevance of the means-end chains to be extracted from subjects and thus the predictive validity of the cognitive structures uncovered. Three main types of elicitation techniques have been proposed (Bech-Larsen & Nielsen, 1999; Grunert & Grunert, 1995; Kelly, 1955; Reynolds & Gutman, 2001, 1988; Steenkamp & van Trijp, 1997):

- Techniques based on sorting procedures—triadic sorting, free sorting or hierarchical dichotomization—which lead subjects to sort objects according to their perceived similarities or differences;
- Direct elicitation techniques—free elicitation or picking from an attribute list—which ask subjects to directly come up with self-relevant attributes or select them from an attribute list generated in a previous qualitative study;
- Techniques based on some sort of ranking or scaling task, in which subjects are asked to rate or rank objects in terms of preference and/or likelihood of usage in a given situation and justify their ranking or rating.

Two studies have addressed the predictive validity of several elicitation techniques within different research contexts (Bech-Larsen & Nielsen, 1999; Steenkamp & van Trijp, 1997). From these studies one can conclude that, if the aim is to obtain insight into how subjects choose between fairly similar and concrete objects, then one should opt for sorting techniques. These seem to produce the highest number of attributes, though mostly concrete, and have the highest discriminative power. However, they are thought to generate the fewest abstract attributes and have the lowest predictive ability. Sorting methods emphasise tangible differences between objects and, as such, may lead to the generation of irrelevant attributes. This may, in turn, produce irrelevant ladders (Bech-Larsen & Nielsen, 1999). Additionally, they are time- consuming and tiresome, which may leave less time and energy for the actual laddering part of the interviews. On the other hand, if the aim is to obtain insight into how subjects compare fairly abstract and dissimilar objects, then direct elicitation techniques seem to be the most appropriate. They are the least time-consuming and produce a high number of abstract attributes. They have, nevertheless, rather low discriminatory and predictive abilities, since they almost totally neglect attributes resulting from the comparison of concrete product features.

Ultimately, if the aim is to obtain the motivations behind consumers' choices in real life, an approach is needed that focuses on the elicitation of abstract

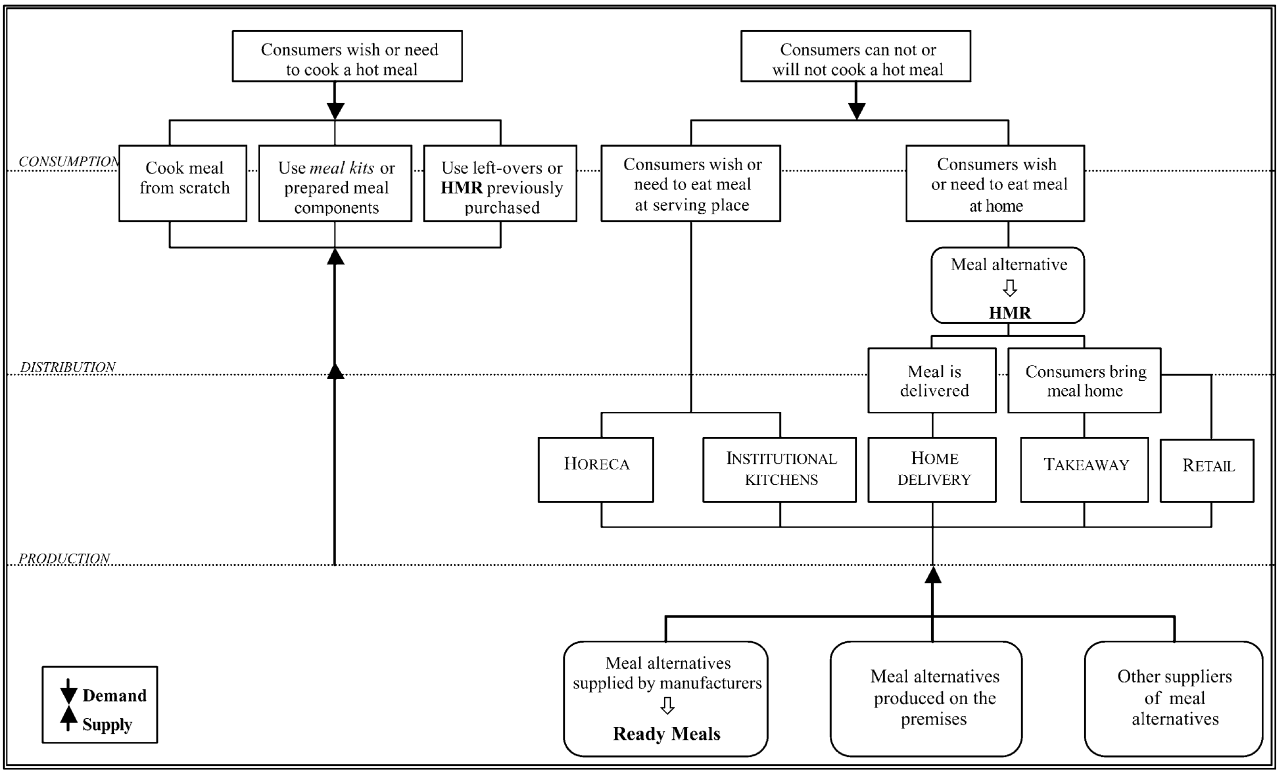

Fig. 2. Multi-step, decision-making process of consumers' meal choice (HORECA: **ho**tels, **re**staurants and **ca**tering) (Costa *et al*., 2001a, 2003a).

attributes (which are instrumental for need satisfaction), without neglecting the concrete ones (which are critical for the differentiation among products in a consideration set). Such approach might lay in the use of ranking or scaling tasks. Since they strike a good balance between abstract and concrete attributes, they are assumed to yield a high number of relevant attributes and have, thus, both good discriminative and predictive ability. Care should be taken, nonetheless, to design a research instrument that does not force subjects to spend a lot of time or energy in ranking or scaling the stimuli, and that very clearly specifies objects and contexts. The use of techniques yielding rank orders of objects according to preference or likelihood of choice has been encouraged (Green, 1992; Grunert & Grunert, 1995; Reynolds & Gutman 2001) and implemented with success in several food-related studies (Bredahl & Grunert, 1997; Jaeger & MacFie, 2000).

Concerning the stimuli to be used in the elicitation task (which are later to be laddered upon), it is advisable to select, besides the product(s) of interest, other product alternatives that could be considered during the consumers' behavioural decision process. Such an approach should be implemented in order to ensure the realism of the interview and the predictive ability of the study. This matter is also related with the importance of assigning context to laddering tasks. The relevance consumers assign to different choice criteria is thought to be situational-dependent. To provide a clearly defined context and an appropriate set of alternatives for elicitation and laddering is thus crucial for the predictive ability of a MEC study. In fact, one of the strengths of MEC, when compared to other models of consumer decision-making, is that the situational-dependency of attribute importance is explicitly acknowledge, being reflected in the associations between ACV uncovered (Asselbergs, 1993; Grunert & Grunert, 1995; Olson & Reynolds, 2001).

An example of how this type of considerations can be taken into account during a MEC study involving food products is depicted in Fig. 2. This multi-step, consumer decision-making process was used to establish an elicitation and laddering procedure for a MEC study on the motivations behind meal choice (Costa, Dekker, Beumer, Rombouts, & Jongen, 2001a; Costa *et al*., 2003a). In this procedure, subjects were asked to rank-order four general meal alternatives (homemade meals,[2] manufactured ready meals, take out meals and eating out at a restaurant), according to the likelihood of choice for dinner on an ordinary weekday and an ordinary weekend in the week of the interview. These meal alternatives were written down in cards, along with some common examples, and presented to the subjects. The last three meal alternatives were selected since they were believed to be the most credible options to homemade dinners in

[2] Whether cooked from scratch or with the help of prepared meal components.

the eyes of Dutch consumers (Candel, 2001; Costa, Schoolmeester, Dekker, & Jongen, 2002a, 2003b; Oude Ophuis, Dekker, & Candel, 1994). An additional reason was the presence of at least one meal representing each of the main vertical pathways depicted in Fig. 2, i.e., homemade, HORECA and HMR.

To ensure that the elicitation of concrete attributes, resulting from comparisons between less abstract and more similar objects, would not be neglected, subjects who chose ready meals as the first or second most likely choice in either of the days went through a second elicitation procedure. In this second procedure, they were asked to rank order five manufactured ready meals (frozen pizza, canned soup, chilled Oriental-style pasta, dried Italian-style pasta and chilled hotpot) according to the likelihood of choice on the day considered during the first elicitation task. The designation of each ready meal was also written down in cards, along with some examples, and presented to the subjects. The products named are within the six most commonly eaten types of ready meals in the Netherlands and are widely present in supermarkets in this country (Costa, Dekker, Beumer, Rombouts, & Jongen, 2002b).

Concerning the actual laddering interview stage, two types of methods can be employed: *hard laddering* and *soft laddering* (Botschen & Thelen, 1998; Grunert & Grunert, 1995). *Hard laddering* refers to all interview and data collection techniques in which subjects are compelled to generate or verify associations between elements within individual ladders, in sequences that reflect increasing levels of abstraction. In *soft laddering*, a natural and unrestricted flow of speech is encouraged during interviews, with associations between ACV being reconstructing subsequently during the analysis. This allows subjects to provide different reasons why one particular attribute is relevant for them, or the same reason for the personal relevance of two different attributes, which is not possible with a *hard laddering* interview structure. Using the results of a MEC study regarding women's ideal fashion stores and clothing items ($n=40$), Botschen and Thelen (1998) have compared the convergent and predictive validities of interviews based on soft laddering with those of written questionnaires following a *hard laddering* structure. These authors have concluded that, although the *soft* and *hard laddering* approaches used in their study produced comparable results, *soft laddering* generated more means-end chains of increased abstraction level (i.e., consequences and values), being probably more appropriate to identify more complex underlying motivations of consumption decision-making. On the other hand, the ease and time-saving aspects of the administration of written questionnaires based on a *hard laddering* structure, and therefore its appropriateness for the study of larger samples of consumers, may render this approach suitable for situations in which the complexity of the underlying consumption motivations is assumed to be low.

Within the context of face-to-face interviews, there seems to be little agreement on which type of laddering technique is more appropriate. *Hard laddering* is suspected to force subjects to generate associations that might not be there begin with, to provide one-sided visions of the motivations under scrutiny and result in boring and rather mechanistic interview environments. On the other hand, it is also said to provide less biased, more comprehensive and more detailed representations of the results than *soft laddering* (Asselbergs, 1993; Jonas & Beckmann, 1998). It has also been suggested that *soft laddering* implies a sounder steering of the interviews, thereby increasing the probability of uncovering relevant MEC with good predictive ability (Grunert & Grunert, 1995). Given that no definite proof of the two techniques' convergent validity has yet been provided (Grunert & Grunert, 1995; ter Hofstede, Audenaert, Steenkamp, & Wedel, 1998), *soft laddering* is usually employed, especially in the case of studies with few subjects and/or more exploratory research. This is also the approach recommended by the motivational view, especially when dealing with broader and more abstract topics (Asselbergs, 1993; Miles & Frewer, 2001; Reynolds & Gutman, 2001).

When dealing with the large samples (>50 subjects) usually involved in segmentation studies, and due to the rather high level of time and expertise necessary to conduct and analyse laddering interviews in these circumstances, substitute, pencil-and-paper or computerised methods have been recommended (Bagozzi & Dabholkar, 1994; Gutman & Alden, 1985; Russel, Flight, Leppard, van Lawick van Pabst, Syrette, & Cox, 2004). These methods usually involve the application of *hard laddering* approaches. In particular, the use of the *Associative Pattern Technique* (APT) (ter Hofstede *et al.*, 1998) is often recommended for market segmentation and/or cross-cultural comparisons, in which the quantification of the results of interviews with large-scale representative samples is required. This technique has already been successfully employed in food-related research (Feunekes & den Hoed, 2001; ter Hofstede *et al.*, 1999).

The process of conducting the laddering interview stage in the context of a mean-end study regarding foods has been described in detail in several publications (Costa *et al.*, 2003a; Miles & Frewer, 2001; Bredahl & Grunert, 1997). Basically, the attributes gathered through the elicitation task are used as starting point for a series of "Why is this important to you?" type of questions, which are intended to lead consumers "up the ladder" of related consequences and values. Sometimes the elicitation task yields consumption motives that are already consequences. In this case, to attempt to link the consequence to product attributes, *reverse* *laddering* can be applied by putting forward the question "What is it about this product that leads to this outcome?" In situations in which more than one product alternative is considered during the elicitation task, the formulation of negative attributes or outcomes is frequent. In these cases, *negative laddering* (or *negative* plus *reverse laddering*) can be employed by putting forward the question "Why do you want to avoid products displaying such features?" This is thought to effectively turn the dialogue from negative attributes or consequences to positive consequences and/or values, with which subjects are assumed to be more able to express their views. In any case, probing for motives both for and against certain decisions should always be included in a MEC study, since only the comparison between the two allows a complete understanding of consumers' decision-making processes. Throughout the interview, and to facilitate the flow of conversation, it is also advisable to use other probes, like third-person probes or re-direction techniques (Miles & Frewer, 2001; Reynolds & Gutman, 2001; Bredahl & Grunert, 1997).

Issues involved in data analysis and presentation of the results

The first stage of data analysis in a classic means-end study is a qualitative one. Its goal is to reconstruct the main lines of reasoning provided during the interviews (which supposedly underlie each subject's views about the object under investigation), in a schematic network of nodes and links—the subject ladders. In order to be able to generate such a schema for each subject, a thorough content analysis of the transcribed interviews takes place (Spiggle, 1994). In this content analysis, meaningful sentences or words in the raw dialogue, corresponding to nodal elements, are isolated, while the stream of the dialogue itself is used to establish the relative position of the nodes and the inter-nodal links. According to the contextual information supplied by the dialogue, the nodal elements in each interview are then classified into a hierarchy of ACV, assigned a label that summarises its content (preferably using the subjects' own words) and linked to each other. At this point, the aggregation of the ladders across subjects can take place, whether the aim is to produce an estimate of a sample's cognitive structure regarding a certain object, or merely to be able to summarily report the major results obtained from a group of subjects. This aggregation is primarily achieved through an iterative coding process, in which the content labels within each nodal category are classified into broader codes until a set of summary codes, reflecting everything relevant that was mentioned by the subjects about the object(s) under study, is established. The set of ACV summary codes should strike a good balance between accuracy, parsimony and broadness of meaning, which is not always easy to achieve. As a general rule, no more than 50–60 ACV summary codes should be generated for each object, so that the second step of the aggregation procedure (the aggregation of the nodal links based on the new codes) can be eased (Gengler & Reynolds, 2001; Grunert & Grunert, 1995; Reynolds & Gutman, 2001).

Content analysis is the core of the analytical procedure in a means-end study, since it is then that the qualitative data provided during the interviews is transformed into nominal codes that can be quantified. Unfortunately, there are not many concrete rules on how such an important step should be conducted. For instance, there is no generally accepted definition of attributes or consequences, or a clear distinction between different types of ACV. Some researchers even argue that capturing the right hierarchical order of the elements mentioned by subjects may be more relevant than forcing the data to fit into ACV categories (Asselbergs, 1993). Consequently, content analysis remains a rather complex and subjective procedure, and its results may always become the object of controversy (Gengler & Reynolds, 2001; Grunert & Grunert, 1995).

In the study of consumers' motivations behind meal choice, we resorted to the LadderMap software to carry out the content analysis of the interviews performed (Gengler & Reynolds, 2001).[3] An initial observation of the data, as well as of recommendations from literature, indicated that the higher the partitioning within ACV categories, the higher the difficulty to properly distinguish between them, and the higher the risk of overlapping (Asselbergs, 1993; Reynolds & Gutman, 2001). Therefore, before the content analysis took place, and for the sake of simplicity and clarity, the two analysts involved agreed to a number of four different, sequential ACV categories—concrete attributes, abstract attributes, consequences and values. This agreement left out distinctions between functional and psychosocial consequences, and between instrumental and terminal values (Olson & Reynolds, 1983). The following definitions for the categories were established (Bech-Larsen, 1996; Bech-Larsen, Nielsen, Grunert, & Sørensen, 1996; Howard & Woodside, 1984):

- *concrete attributes*—tangible, visual characteristics of meal alternatives or ready meals, including package and labels, such as "does not contain meat", "expensive" or "fully cooked";
- *abstract attributes*—intangible, subjective characteristics of meal alternatives or ready

[3] The advantages and disadvantages of this, and other types, of software employed in the analysis of laddering data have been discussed in detail by Gengler and Reynolds (2001) and Grunert and Grunert (1995). Recently, a new, highly improved software for MEC application studies has been introduced, which seems to facilitate considerably the tasks involved in the analysis of laddering interviews and generation of HVM (www.skymax-dg.com/mecanalyst/index.html).

meals that cannot be assessed without consumption or that have to be inferred from other internal or external information sources (possible examples are "tasty", "unhealthy" or "easy to prepare");

- *consequences*—expected functional and psychological implications of purchase, consumption and disposal of meal alternatives and ready meals, such as "easy to digest", "no need to cook" or "keep fit".
- *values*—specific modes of conduct or end-stages of existence that are permanently believed to be personally or socially preferable, *i.e.*, the individuals' existential goals or subjective norms (examples are "good health", "optimal performance" or "comply with expectations").

Sets of summary labels were independently developed by each analyst for each meal alternative in each situation (weekday and weekend) and for each ready meal under study, since several labels were expected to be unique to specific meals. The two analysts finally confronted their sets, which diverged only on 8% of the labels. These divergences were discussed and solved by re-analysis of the documentation and mutual agreement (Asselbergs, 1993; Bech-Larsen, 1996; Grunert & Grunert, 1995). These sets of summary labels were then used to, based on the interview transcripts, reconstruct the individual subject ladders. These subject ladders underwent an additional coding process, having in mind the aggregation of the results. This process consisted mainly in the reduction of the number of labels by combining opposing elements under one code that designated an underlying construct. For example, "not tasty" and "tasty" were combined under "taste", and "more effort put into cooking" and "less time spent on cooking" were combined under "time and effort put into cooking". The software used automatically readjusts the individual subject ladders according to new codes.

The second stage of analysis in a MEC study is a quantitative one, in which the codes resulting from the content analysis are used to aggregate across the individual subject ladders and produce a graphical representation of the results. This representation summarises the subjects' means-end chains regarding the object under investigation. The number of times two codes were linked to one another, either directly or indirectly, by subjects during the laddering task is counted,[4] so that all direct and indirect connections between each pair of codes corresponding to one object can be represented in a square matrix format. This so-called *implication matrix* is then used to derive a map—the *hierarchical value map* (HVM)-, in which the most important ACV (content) and the links most frequently established among them (structure) are represented in a diagrammatic form. The direct links in this map indicate a direct cause-effect association between two codes, whereas the indirect ones reflect only a general association between them. HVM based only on direct links can also be constructed, but only if *hard laddering* is used, otherwise it may prove impossible to reconstruct similar ladders enough times to enable their representation in the map (Bagozzi and Dabholkar, 1994; Olson & Reynolds, 2001; Reynolds & Gutman, 2001; Reynolds & Gutman, 1988).

The decision regarding what elements and links should be represented in a HVM is usually the result of a trade-off between retaining enough information from the interviews and producing a simple, clear and sufficiently self-explanatory map. This trade-off, which depends on the number of subjects interviewed, the degree of homogeneity of the information they provided and the efficacy of the content analysis performed, is usually materialised by the definition of a *cut-off point*. This cut-off point indicates the minimum number of times a direct or indirect link between two codes has to be established by subjects in order to appear in the HVM (Gengler, Klenosky, & Mulvey, 1995; Reynolds & Gutman, 2001). There are several criteria for the selection of an appropriate cut-off point. Reynolds and Gutman (2001) recommend trying multiple cut-off points and evaluating the respective solutions in terms of the level of information and interpretability provided. They suggest that a cut-off point of between 3 and 5 is usually appropriate for a sample of 50–60 subjects. Another option is to find an optimum between the cut-off point (proportional to the HVM's parsimony) and the proportion of direct plus indirect links in the implication matrix that actually appear on the map (proportional to the amount of information retained), for each cut-off point selected (Baggozi & Dabholkar, 1994; Reynolds & Gutman, 2001). Nevertheless, a more theoretical or statistical criterion guiding the choice of an appropriate cut-off point is yet to be established (Grunert & Grunert, 1995).

Apart from the selection of a cut-off point, the *principle of non-redundancy* imposed upon the aggregation process also influences the final appearance of HVM and the information they provide. The principle of non-redundancy implies that direct links established by subjects between two non-consecutive codes are shown only if the subjects did not provide other ladders in which these codes are connected by an intermediary code. Due to this principle, some direct links may be lost during aggregation. Thus, unless subjects are able to provide fairly homogeneous ladders, chains may be passing through intermediary codes that are not relevant to all subjects (Gengler *et al.*, 1995; Grunert & Grunert, 1995).

The homogeneity of the information provided during laddering also determines the way an HVM can be inter-

[4] Each direct or indirect link established between two codes is only counted once per subject.

preted. If the means-end chain structure obtained for a certain object of study can be regarded as homogeneous, then this structure can be taken as a valid estimate of the cognitive structure of the subjects concerning that same object. If not, it can be only considered as a mere summary of the study's main results. Ideally, homogeneity should be investigated before the generation of the HVM, for instance through cluster analysis (Grunert *et al.*, 1995). This type of analysis can use the data depicted in the implication matrix to check whether clusters containing distinct sets of linked codes are formed (an indication of non-homogeneity). Multidimensional scaling, using as measure of distance the sum of the direct and indirect associations between ACV categories, can also be employed to test the content validity of the associations expressed by an HVM (Bech-Larsen *et al.*, 1996). Alternatively, a correspondence analysis method developed by Valette-Florence and Rapacchi (1991) can be employed to, based on the frequency of ACV mentioned (and excluding the sequences), show whether and how different subject groups stress different ACV. A perhaps easier and equally established procedure is to determine the *consistency index*, which diagnoses the degree of homogeneity expressed in a certain HVM (Grunert & Grunert, 1995). For any chain depicted in an HVM, this index shows the difference between the highest frequency of any direct link in the chain and the frequency of indirect links between the start and the end code in the chain. The higher the consistency index of a chain, the higher the likelihood that this chain has resulted from the aggregation of different ladders across subjects. Consequently, the less it becomes appropriate to judge this chain (and the whole HVM along with it) as an excerpt of the "true" cognitive structure of subjects regarding the object investigated.

The evaluation of the ability of a HVM to accurately express consumers' knowledge structures remains a fairly subjective and unreported topic. Little is known about how software type, cut-off point selection, content analysis procedure, stimuli's abstraction level and sample heterogeneity (in terms of socio-demographic, cognitive, affective and behavioural aspects) affect the content validity of a HVM (Grunert & Grunert, 1995). Consequently, there is no generally accepted consistency index value that separates a valid from an inappropriate HVM.

Fig. 3 depicts an example of a HVM generated for the ready meal category (originated by non-users users of ready meals) through the above-described procedure (Costa *et al.*, 2003a). The relative frequency of association of two elements by subjects is represented in this HVM by lines of proportionally varying width. There is, however, no relation between the area of the shapes representing the different elements and the number of subjects who mentioned them. The figure caption provides information about the cut-off point selected and the average consistency index obtained, as well as the percentage of direct relationships present in the implication matrix that is actually depicted in the HVM. This percentage can be taken as an index of the ability of the HVM to express the aggregated data contained in the implication matrix (Reynolds & Gutman, 2001).

Assuming that a certain HVM expresses the subjects' knowledge structures regarding the object under study accurately, the question still arises as to whether a valid prediction of the subjects' actual consumption behaviour can be made based on these structures. Several research efforts have been made in this context that attempt to uncover significant relations between subjects' means-end chain structures and different behaviours and behavioural determinants, such as past behaviour, preferences, attitudes and behavioural intentions. Reynolds and Perkins (1987) have developed a method for assessing the predictive validity of HVM through *Cognitive Differentiation Analysis*. This is an analysis at the subject level that uses ordinal regression to relate vectors of ratings of products (i.e., subjects' ratings on the degree to which products are perceived to possess or facilitate different ACV) to a matrix depicting pairwise preference or perception judgements about these products. This approach implies, however, that extra information—product ratings and preference or perception judgements—has to be collected during the laddering interview (Gutman, 1991). Alternatively, Grunert (1997) has employed an extension of conjoint analysis (Green & Rao, 1971) to analyse the relations between the perceived quality dimensions of beef, the perceived benefits deriving from beef consumption and the motives for purchase of this type of meat.

Bagozzi and Dabholkar (1994) have explored the relations between consumers' means-end structures regarding recycling, past behaviour and two constructs of the *theory of planned behaviour* (Ajzen & Fishbein, 1980), attitudes and subjective norm. They concluded that the majority of meanings and linkages in the means-end structures provided significant explanatory content for the attitudes, subjective norms and past behaviours considered in their study. The same could, however, not be concluded for the case of behavioural intention. Similarly, Grunert, Sørensen, Johansen, and Nielsen (1995) used the results obtained from a means-end study of the motivations underlying Danish consumers' choice of different types of meat and fish as basis for a theory of planned behaviour study regarding consumers' intention to buy fresh fish. The outcome of the latter study indicated that some, but not all, parts of the means-end chain structures uncovered had had an impact on the formation of consumers' intention to buy fish. These results underlie the main difficulty of converting MEC into a theory of choice behaviour with sufficient explanatory and predictive power, which is that research could not present until now a solid hypothesis as to how certain parts of individual cognitive structures

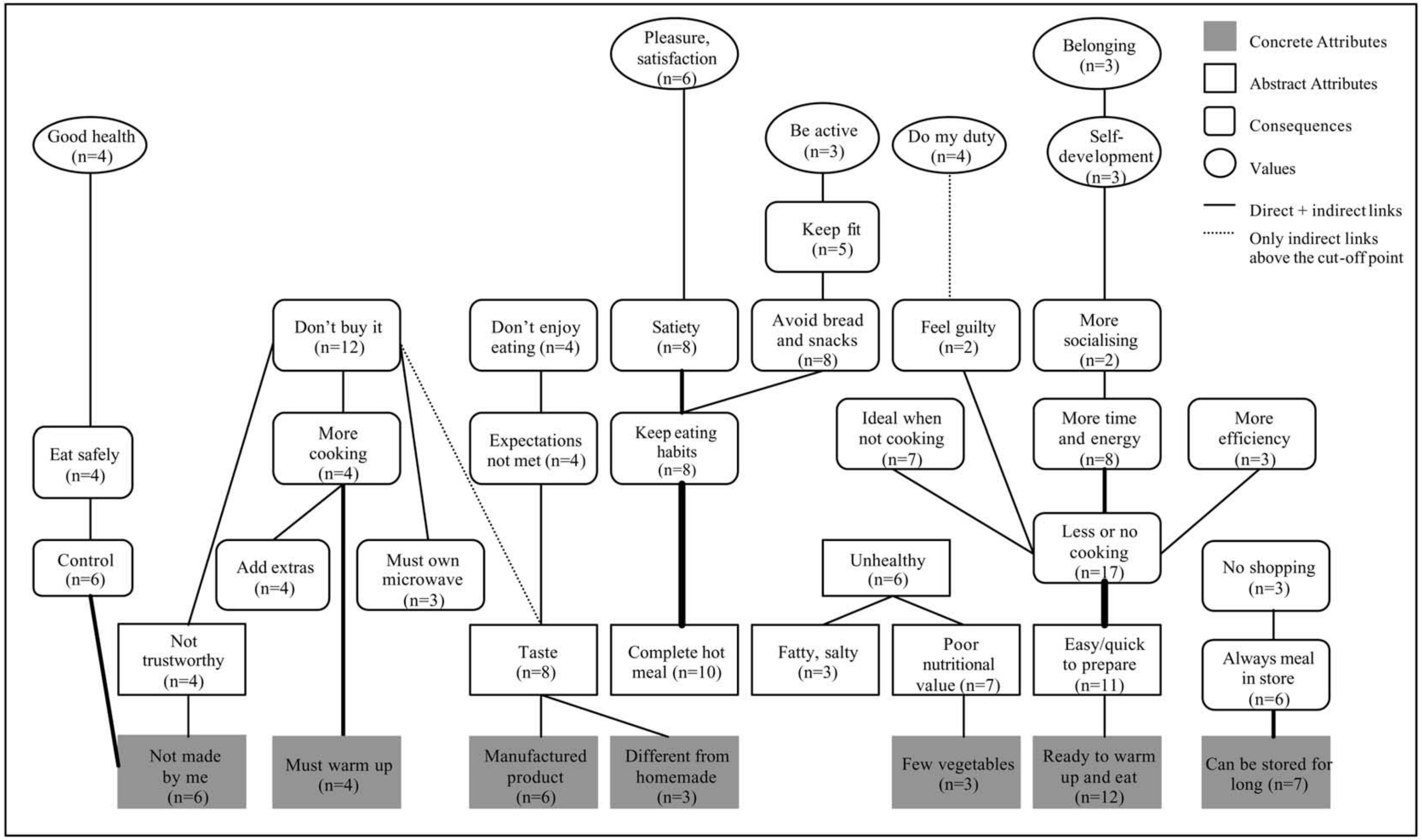

Fig. 3. Hierarchical value map of ready meals for non-users (frequency of use ⩽once/month, $n = 20$, cut-off point = 2). This HVM represents 59% of all direct links between two codes mentioned during the laddering interviews. Average consistency index = 2.6 (Costa *et al.*, 2003a).

become behaviourally relevant in a given decision-making situation (Grunert *et al*., 1995).

Virtues and shortcomings of MEC and associated techniques

At first look, MEC and associated techniques seem to bridge successfully the gap between the qualitative and quantitative methods most frequently employed in the early stages of consumer-oriented product design (*idea generation* and *opportunity definition*) (Dahan & Hauser, 2002). Like other qualitative methods, they provide a holistic view of consumption motives and allow access to the ways in which consumers perceive products and themselves, as well as to the words they use to express these perceptions. However, and unlike focus groups, in-depth interviews or projective techniques, MEC studies elicit responses from subjects that can be quantified and used to build estimates of consumers' knowledge structures with predictive value. MEC studies' outcomes are thought to provide (Audenaert & Steenkamp, 1997; Bech-Larsen & Nielsen, 1999; Grunert & Valli, 2001; Nielsen *et al*., 1998; ter Hofstede *et al*., 1999).

- A better understanding of consumers' cognitive positioning of existing products;
- A more adequate development of positioning strategies for new products;
- An improved understanding of which are the relevant consumer needs and which product attributes deliver those needs;
- More focus for product improvement programs, by showing which current or potential product attributes are valued by consumers and which are not;
- More focus for marketing communication strategies, by highlighting the relevant links between product knowledge and self-knowledge established by consumers.

In spite of this, MEC and associated techniques suffer from some shortcomings that, in our opinion, limit the extension of their application beyond exploratory studies and the early stages of product design. Firstly, laddering interviews and their traditional methods of analysis are very labour- and time-intensive, which precludes their use with large consumer samples. Paper-and-pencil or computerised questionnaires based on a *hard laddering* approach can greatly reduce this limitation, but the question remains as to whether they can also yield data comparable to those resulting from interviews in which *soft laddering* is employed. Secondly, as we have amply demonstrated throughout the section on "The means-end chain theory and associated techniques" of this paper, the content and predictive validity of MEC studies can be greatly compromised by a number of factors, such as lack of an established theoretical framework, sample characteristics, data collection methods and analysis techniques. Finally, we must also not forget that perceived product attributes (whether abstract or concrete) are not yet tangible, measurable product features that can be object of characterisation. That is, consumers' perceptions of product features have yet to be adequately translated into products' technical specifications. Therefore, the question to be asked at this point is: will a product designed based on the knowledge of target consumers' cognitive structures indeed have significantly more chances of success that one which has been designed otherwise?

It is clear that the focus of MEC is, as marketing researchers advocate, at the level of the outcomes of consumption, i.e., at the level of the key benefits driving consumers' motivations (Gutman, 1991). Accordingly, means-end data in food-related research are typically rich in consequences and abstract attributes, while poor in values and concrete attributes. Setting aside momentarily the potential influence on this matter of the type of laddering interview and attribute elicitation technique used (already discussed in the section on "The means-end chain theory and associated techniques"), we would like to purpose that other factors may lie closer to the source of this unbalance. For instance, since food selection and purchase are mostly highly routinised and habitual behaviours, consumers may experience difficulties in making the links between consumption motivations and underlying individual values explicit. Moreover, because their expert knowledge on foods is limited, consumers are naturally weak in inferring outcomes from concrete product features. Consumers may have, likewise, serious misconceptions about the links between product attributes and consumption consequences. But, most relevant of all, is perhaps the fact that consumers cannot infer consumption consequences from products that do not yet exist. Consumers' cognitive structures regarding existing products can provide only but a glimpse of how they would perceive a truly innovative product[5]. Therefore, means-end data may have limited use in the guidance of (proactive) R&D efforts.

Conclusions and future trends for the application of MEC in consumer-oriented food product design

This paper has provided an overview of the main conceptual and methodological issues involved in the implementation of MEC and associated techniques in the context of food-related research. We have also discussed some of the particular advantages and

[5] The introduction of truly new products usually implies that consumers have to construct new product knowledge structures, rather than simply adjusting existing ones (Moreau, Markman, & Lehmann, 2001).

Box 1. Research areas that can improve means-end theory applications

- The development of (computer-aided) interview and data analysis methods generating HVM with improved content validity (Grunert, Beckman, & Sørensen, 2001);
- Advances in the development of methods that can adequately test the value of means-end chains as valid estimates of consumers' cognitive structures and as predictors of choice behaviour (Grunert, Beckman, & Sørensen, 2001);
- Create a detailed framework which, by integrating consumers' product knowledge structures in the Voice of the Consumer (Griffin & Hauser, 1993), confers a consumer-based hierarchical structure of needs to Quality Function Deployment programs, thereby improving their content validity (Costa, Dekker, & Jongen, 2001b);
- Counteract the excessively semantic and verbo-centric nature of MEC by attempting its integration with more metaphor- and image based elicitation techniques Christensen & Olson, 2002; Costa et al., 2003b);
- Develop computer and web-based interface tools which enable R&D representatives to directly interact with consumers during laddering interviews, since this can lead to a better understanding of the links consumers establish between product attributes and consumption outcomes (Dahan & Hauser, 2002);
- Develop information-acceleration and virtual-reality tools that allow consumers to develop knowledge structures about truly innovative concepts and prototypes, thereby facilitating the use of means-end theory in the context of discontinuous innovation processes (Dahan & Hauser, 2002).

disadvantages of the application of MEC and laddering studies in consumer-oriented food product design processes. It is our main conclusion that methodological issues related with MEC studies' content and predictive validity, together with some shortcomings related to specific aspects of food design, pose some serious obstacles to the full implementation of MEC in a consumer-oriented product design process. However, we are still of the opinion that MEC has the potential to provide an increasingly better understanding of consumers' product knowledge and its behavioural implications. Consequently, we also believe that it has the potential of becoming an increasingly valuable tool in consumer-oriented food design processes. We therefore suggest, in Box 1, some of the areas in which more research may help minimise the methodological and implementation shortcomings of MEC. We anticipate that progresses in these research areas can extend and improve the implementation of MEC and associated techniques within consumer-oriented food product design, with the consequent desired gains in its efficiency and effectiveness.

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