Analytic Hierarchy Process and Discrete Choice
A comparison of these methods applied on the product development of fresh milk

University of Natural Resources and Life Sciences
Vienna

Master's Thesis

Name: Martin Leonhard Horndasch
Matriculation No.: 0941283
Department: Marketing and Innovation
Supervisor: Ao. Univ. Prof. Dipl.-Ing. Dr. Rainer Haas

June 24, 2012

Declaration

I hereby declare that I have created this work completely on my own and used no other sources or tools than the ones listed, and that I have marked any citations accordingly.

$\overline{Vienna, June 24, 2012}$

Martin Leonhard Horndasch

Contents

Abbreviations

AHP ...	... Analytic Hierarchy Process
AMA ...	... Agrarmarkt Austria
BOKU ...	... University of Natural Resources and Life Sciences (Vienna)
CBC ...	... Choice Based Conjoint
CI ...	... Consistency Index
CM ...	... Conjoint Measurement
CR ...	... Consistency Ratio
DC ...	... Discrete Choice
EC ...	... Expert Choice
ESL ...	... Extended Shelf Life
EU ...	... European Union
GMO ...	... Genetically Modified Organism
LL ...	... LogLikelihood
MIS ...	... Market Intelligence System
NPD ...	... New Product Development
R&D ...	... Research and Development
SME ...	... Small and Medium Sized Enterprises
SPSS ...	... Statistical Package for the Social Sciences
TFQ ...	... Total food quality
USP ...	... Unique Selling Proposition

List of Tables

List of Figures

A Theoretical Part

1 Introduction

In the 1963 picturized film "Il Gattopardo" [1], directed by Luchino Visconti, a famous italian producer, the young Tancredi Falconeri says (cf. BROCKHAUS, 2006, 144):

«If we want things to stay as they are, things will have to change.» [2]

Looking at the circumstances companies face on the markets today, this statement really has become a hard truth (cf. COOPER, 2004, 4). For established products as well as in the field of new product development (NPD), the change and improvement of features became both: more important as well as more complex for the actors (cf. GRIFFIN, 1997, 450).

Failure, due to high costs or too much time spent for the developing process, is able to threaten a company's existence (cf. COOPER, 2004, 8, 11). Consequently the process of NPD has to be linked with the demands of the customers in order to increase the chances of the product (cf. COOPER, 2004, 14). Therefore companies can choose from a variety of tools to do market research with (cf. KOTLER et al., 2007, pp. 158), two of them will be presented in this work.

1.1 Background

Consumers seem to seek for varieties and choice among all kinds of consuming goods which is a natural occurring phenomena based on the need to make choices, getting used to products with their features and in the end consumers get bored buying always the same things (cf. TRIJP, 1995, 9). Switching brands means for consumers to escape at least a bit of this annoying circle (cf. TRIJP, 1995, 9). Perhaps the concept of getting bored from a choice task is one of the most important drivers for this process: The chosen product's attractiveness might decline and at the same time the alternatives' might rise (cf. TRIJP, 1995, 173).

Food processing enterprises of course have noticed this development (cf. NESTLÉ, 2008, 2). Reacting on this development has become an existential struggle for companies which face two counterparts: time and the opponent which is ready to copy your

[1] Written by Giuseppe Tomasi di Lampedusa (*1896, †1957); Published in 1958.
[2] Original: «Se tutto deve rimanere com'è, è necessario che tutto cambi.»

idea (cf. COOPER, 2004, 2, 4).

Remembering the quotation from above, we could say: Any entrepreneur who does not match consumer wants and needs with his product will face difficult circumstances for his enterprise. Instead you could say: "If you do not change or adjust the features of your product according to customers' needs, you will risk being drawn out of the market". In order not to misspend resources during the process, the first task is to identify precisely what your customers really want and adjust the product accordingly to meet those needs (cf. KOTLER et al., 2007, 1132).

1.2 Aims of this work

As NPD and market research both are very expensive, consequently companies have a high interest in valid and reliable results of such studies (cf. SWINK et al., 2006, 558). Conjoint measurement (CM), developed by LUCE and TUKEY in the 1960s of the last decade got a methodological "competitor" in the last decades: The Analytic Hierarchy Process (AHP) which was developed by SAATY the 1980s.

Since that time both methods and new approaches to them, get compared and the results are discussed in scientific literature, e.g.: TSCHEULIN (1991), MULYE (1998) and SCHOLL et al. (2005). This work wants to compare the AHP with Discrete Choice (DC) focussing the food product fresh milk as research objective. The structure is as following:

- The theoretical part focuses on food companies and consumers, their behavior and interactions get presented.
- AHP and Discrete Choice with the theoretical framework and the research design of the study are next.
- Results, comparison and discussion of both methods form the second part of the work.

1.3 Research questions

By applying the two methods and comparing their results, following main research question, as well as two secondary ones, are tried to be answered:

- **Do both research methods lead to the same results?**
- How does the ideal product in the category of fresh milk look like for our sample?
- Are there strengths/weaknesses of the methods?

2 The food industry and the consumer

This chapter starts with figures on the food industry in Europe. The consumers as well as the production side with their points of view will be mentioned. By focusing recent trends in society, the research objective fresh milk should get closer to the focus.

2.1 Facts and figures on the european food market

Europe's food sector is a very important part of the whole industry in the 27 states: A total turnover of EUR 917 bn. accounting for 14% of all employment in manufacturing and 14.5% of its turnover (cf. EUROPEAN COMMISSION, 2011, s.p.). About 4.8 mio. europeans work for 310,000 companies in the food sector; most of them in small or medium sized enterprises (SMEs) acting rather local than global (cf. EUROPEAN COMMISSION, 2011, s.p.).

The food sector is by added value of EUR 175.6 bn (in 2001) on second place, right behind the metal processing industry (cf. LIENHARDT, 2004, 1). By 2008, EUR 195.3 bn. were reached, besides the turnover grew to a total of EUR 992.8 bn. (cf. CIIA, 2010, 4).

Countries with strong national economies like France, Germany and the UK contribute with 53% of the turnover. Productivity per employee in this sector shows a span from EUR 15,000 up to EUR 50,000 (cf. LIENHARDT, 2004, 2). Both types of enterprises are found, large ones operating cross-national and small firms[3]; further big firms are rather to be found in northern regions, smaller ones dominate the south (cf. LIENHARDT, 2004, 4). Unfortunately R&D has a difficult status: only 0.37 per cent of the companies' expenditures are re-invested (cf. CIIA, 2010, 3).

2.2 Buying process

STRECKER et al. (1976) researched on customers' behavior when drawing buying decisions and their influences on them (cf. STRECKER et al., 1976, 43). Neither economists nor social sciences nor psychologists can explain it without knowledge from the other disciplines but each contributes to this puzzle (cf. STRECKER et al., 1976, 43). As behavior can just be recorded through the purchase of a product, there was made the

[3]The number of 50 employees per company marks the difference

attempt to connect this with the previous efforts in marketing (cf. STRECKER et al., 1976, 43). The symbol of the customer as "black-box" emerged (cf. STRECKER et al., 1976, 43). Taking this as starting point, scientists have claimed, there must be a level of jurisdiction within the customer, which controls his behavior, sets level for divergence and acceptance, records further data and is able to react on unusual situations (cf. STRECKER et al., 1976, pp. 43).

The buying process is induced by realizing that there is a circumstance the person is not comfortable with (cf. STRECKER et al., 1976, 44). The individuals then search for alternative solutions, perhaps choose one of them and evaluate the choice (cf. STRECKER et al., 1976, 44).

Buy food follows a habitual or impulsive decision process (cf. STRECKER et al., 1976, 44). A high shopping frequency leads to an accustomed behavior, indicated by immediate purchase just after recognizing the product (cf. STRECKER et al., 1976, 44). Any purchase or act of consuming adds information to the customer's knowledge of the product and may influence it in a positive or negative way (cf. STRECKER et al., 1976, pp. 45). Economic theory developed several models of consumer behavior which can be grouped into three categories (cf. STRECKER et al., 1976, pp. 47):

Economic models try to predict consumers' behavior by rational means: Everyone tries to maximize his utility (cf. STRECKER et al., 1976, 47). But this assumption is violated in reality and changes by time and available budget (cf. STRECKER et al., 1976, pp. 47).

The sociological interpretation wants to identify the customer being a member of different interacting systems and groups of society (cf. STRECKER et al., 1976, 49). The family is seen to be - by far - the most influencing group next to friends, colleagues, neighbors, which all make prediction even more complex (cf. STRECKER et al., 1976, pp. 50).

The motivation-psychologist's approach comes from FREUD's findings on psychological theory: The individual is influenced by society and uncontrollable action from inner motivation and inherent motives – the problem remains which of the three contributes in what amount (cf. STRECKER et al., 1976, 53). Further an individual perceives and rates the product as a whole, not as a combination of the pieces and single parts, what is rather unusual to them (cf. STRECKER et al., 1976, pp. 188).
To put this all into a nutshell, scientists and enterprises have to accept when describing

motives and research on them can be done with new research techniques, that there is a variety of consumers than homogeneous groups (cf. STRECKER et al., 1976, 56).

Consumers' perception of (new) products focuses mainly the three points: "condition, packaging and labelling" (STRECKER et al., 1976, 188):

Condition corresponds to the the product's state: liquid or solid - mostly core-related features (cf. STRECKER et al., 1976, pp. 190). Physical condition can extend a product's range of use, draw customers' attention on it or just simplify its transportation, e.g.: space-saving packaging (cf. STRECKER et al., 1976, pp. 188). The design departments incorporate ideas from psychologists: even, routine, smooth and if possible inspired from geometric shapes (cf. STRECKER et al., 1976, pp. 188).

Packaging is both an economic struggle companies are facing, too and important for the products' perception (cf. STRECKER et al., 1976, pp. 193). Transferring this to our research topic, milk is transported in boxes as they are easier to manage and you do not waste space in transportation vehicles. Furthermore the producer has to ensure the product's attractiveness on the shelves instore.

Labelling communicates information to the customer which is seen to be one of the drivers of the buying process (cf. STRECKER et al., 1976, pp. 194). The most important criteria are names and symbols which aim to be eye-catchers (cf. STRECKER et al., 1976, pp. 194). Well-known symbols get associated with quality and there are labels backed up by law and institutional control (cf. STRECKER et al., 1976, pp. 194). According to given restrictions, each producer can use one or more of them for his products (cf. STRECKER et al., 1976, pp. 194). Having successfully established a brand that is well recognized with good reputation due to its quality then you really have the clue in a manager's career (cf. STRECKER et al., 1976, pp. 194).
All the three points' contribution, whether in objective or subjective way, considered together are forming that what consumers call quality of a product (cf. STRECKER et al., 1976, pp. 196). The image of a product results from the influences of commercials, peer groups, pricing, availability and individual's intrinsic motives (cf. STRECKER et al., 1976, pp. 196). This image is one important factor besides others for a consumer to to buy a product (cf. STRECKER et al., 1976, pp. 196).

2.3 Involvement

Involvement describes someone's behavior being really part of a process and therefore considers decisions with much effort (cf. TROMMSDORFF, 1993, 48). Processes

with high involvement are the exception, the opposite is more frequent (cf. TROMMSDORFF, 1993, pp. 48). Low-involvement processes can be characterized as following (cf. TROMMSDORFF, 1993, 50): The search for alternatives and information remains at a low level as both, the range of the alternatives' decision process is limited as well as the consequences are not severe. (cf. TROMMSDORFF, 1993, 50). As a result it seems quite useful to find out about the potential of a product being able to create involvement (cf. TROMMSDORFF, 1993, 51).

According to the model of involvement, the decisions to buy a product can be categorized by routine, lying behind the purchase and the parts in mind contributing to it. Real decisions require an intensive preoccupation with the object; The consumer has to consider the alternatives' features and to weigh pro and contra arguments before his decision (cf. KOTLER et al., 2007, 291). Additionally he has to develop an own point of view before deciding (cf. KOTLER et al., 2007, 291).

Limited decisions do not have the affective component, consequently the amount of involvement is reduced with respect to the first (cf. KOTLER et al., 2007, 293).

The third group's products are bought regularly, or even daily, own points of view manifest by advertising campaigns in which pictorial information plays a big role (cf. KOTLER et al., 2007, pp. 293).

Impulsive shopping happens because consumers seek for variety among goods, something different to the usual things (cf. KOTLER et al., 2007, 294). For more information on variety-seeking behavior in food, MEIXNER (2000) conducted a study focussing on different food products.

Table 1 sums this up and shows relations and connections among buying decisions and type of involvement, based on the results of TROMMSDORFF (1993, pp. 49) and KOTLER et al. (2007, pp. 291). Theoretical findings on humans' emotions suggest a connection between them and people's actions (cf. TROMMSDORFF, 1993, 61). Both, markets and products for consumer goods are highly developed and product's exterior and image get right into the focus of an emotional product positioning (cf. TROMMSDORFF, 1993, 73). Key information for the consumer are provided by following items (cf. TROMMSDORFF, 1993, 73):

- Brand of the manufacturer and the corresponding (visual) label

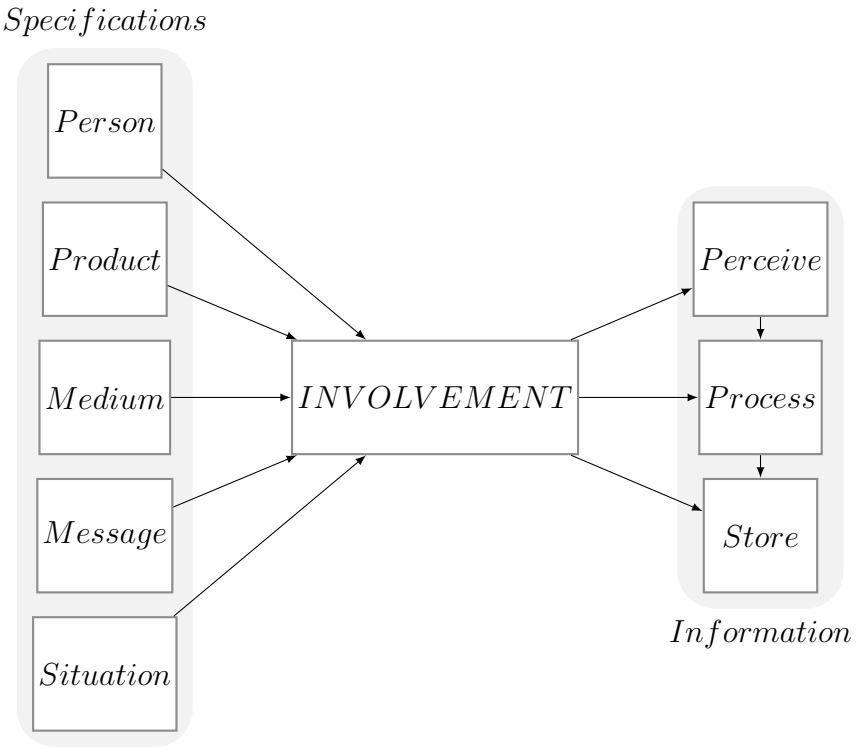
- Price
- Recognizable advertising and independent testing reports
- Regional origin

Figure 1 sums up that the involvement can be related to personal, situational, product and other factors.

Table 1: Types of purchase decisions with their amount of involvement

Buying decision	Affective	Cognitive	Reactive	Amount of Involvement
Real decision (extensive)	x	x		high
Limited		x		
Routine			x	
Random (impulsive)	x		x	low

Figure 1: Model of Involvement



2.4 The Total Food Quality Model

Further aspects got introduced and connected with a new approach by GRUNERT et al. (1996):

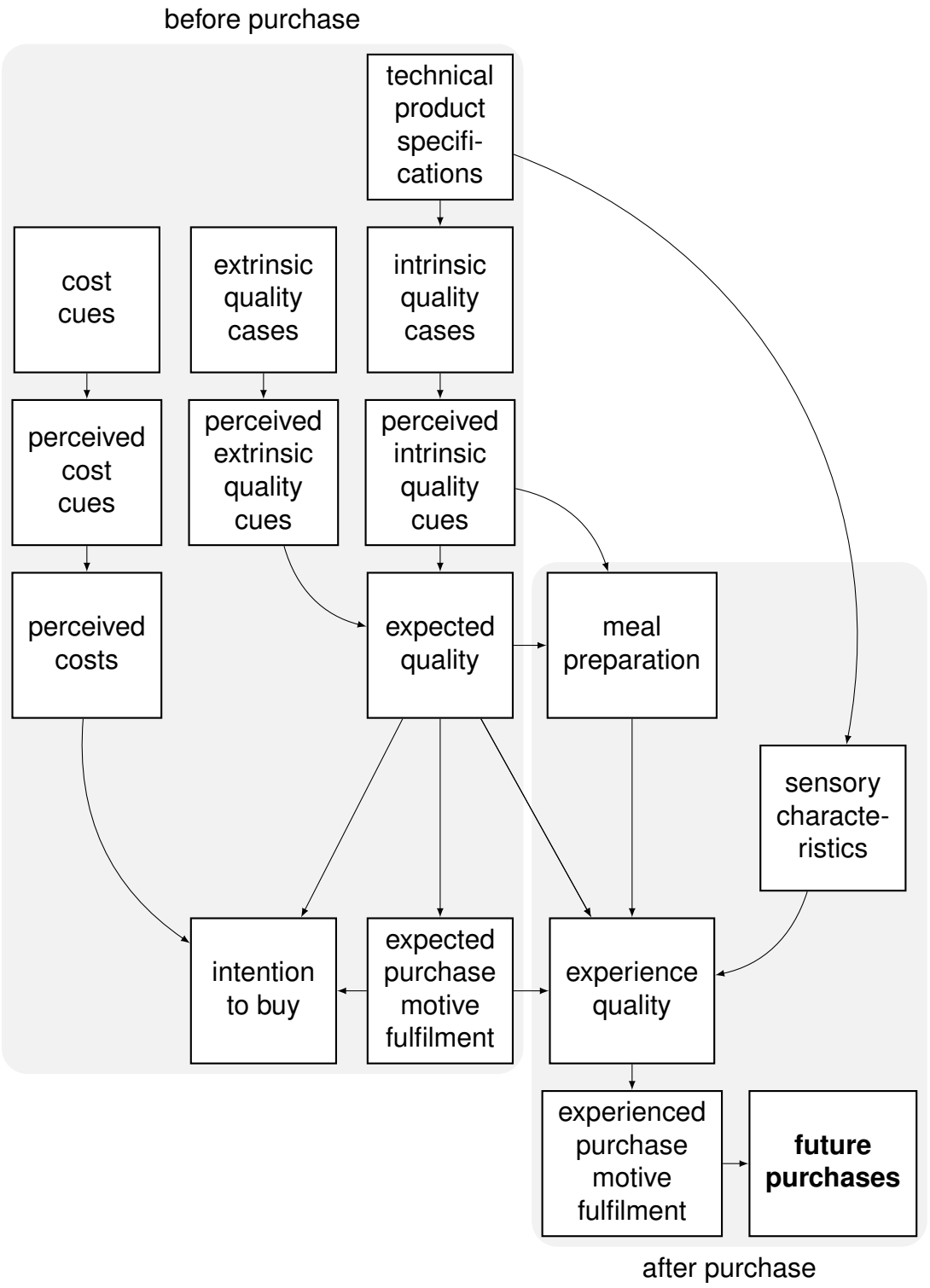
- Experienced quality is all that the customer noticed through his way preparing the meal, no matter if the quality is essential (cf. GRUNERT et al., 1996, 81).
- Perceived and experienced quality will occur and the consumer has to decide on their congruence (cf. GRUNERT et al., 1996, 81).
- Characteristics derived from sensors is moderated by three points: technical specifications, experience and preparation (cf. GRUNERT et al., 1996, 81).
- Finally the consumer weighs perceived quality with the expectations made before purchase and decide on further purchase (cf. GRUNERT et al., 1996, 81).

The Total Food Quality Model connects points from production, consumption or culture together in a graphical relation and is shown in figure 2 (cf. GRUNERT et al., 1996, pp. 81).

This model can be the starting point for choice experiments: "quality cues", "quality aspects", "purchase motives" and their dependencies among each other can be focused (cf. GRUNERT et al., 1996, 85). Before launching a research experiment, interviews with a focus group in order to find out about quality perception or perhaps unnoticed important aspects and motivations are suggested (cf. GRUNERT et al., 1996, 109).

In its horizontal dimension, between purchase and evaluation, the product has to be consumed and experienced (cf. GRUNERT, 2005, 372). The vertical compartment refers to the means-end approach: it shows until what level the quality and its signals are getting noticed by the consumer (cf. GRUNERT, 2005, 374). Liking a product and brand loyalty depends on how deep this chain meets consumers' real needs (cf. GRUNERT, 2005, 375). Laddering methods and the resulting hierarchical value maps help to bring this altogether in an order (cf. GRUNERT, 2005, 375).
GRUNERT (2005) mentions that this is a critical point for any new product, as consumers do not bear any feeling or connotation in mind with respect to it; Rejection is the consequence when expectations are not met (cf. GRUNERT, 2005, 378). Success and failure are very close at this stage (cf. GRUNERT, 2005, 378).
One attribute with growing importance, is "credence": a quality attribute associated with health and functional food or organic food (cf. GRUNERT, 2005, 379). Any additional amount of information about quality issues is able to change the perceived level (cf. GRUNERT, 2005, 380).

Figure 2: The Total Food Quality Model



2.5 The food industry and innovation

RAMA and TUNZELMANN (2008) have researched on the topic of "innovation" as well as "R&D" in the food industry, especially its amount according to company size. Following, the most important findings are summarized in Table 2 (cf. RAMA and TUNZELMANN, 2008, pp. 14):

The food industry's numerous dependencies in supply and demand were tried to be shown in the table. Hard evidence that a concentrated market induces higher R&D activities or increased expenditures was not found, but market concentration and technological advance are supposed to support the effect (cf. RAMA and TUNZELMANN, 2008, 32).

2.6 Competitive environment and co-operation among companies

As we have seen in the previous part, the food industry is closely related with other branches. Being a low tech industry an increasing influence of new technologies from related industries is recorded (cf. GALIZZI and VENTURINI, 2008, 51). Hence the amount of new products cannot be taken for a measure of innovative power (cf. GALIZZI and VENTURINI, 2008, 51). A closer related co-operation in vertical direction may be due to a higher competition (cf. GALIZZI and VENTURINI, 2008, 52). From consumers' viewpoint, new products elevate quality and variety to a higher level (cf. GALIZZI and VENTURINI, 2008, 52).
Accelerating trends require a management structure by continuously integration of a company's departments, so they even form the companies (cf. GALIZZI and VENTURINI, 2008, 53). Studies indicate the increasing importance of this competitive advantage, it is seen to be right behind the primary target to produce high quality products (cf. GALIZZI and VENTURINI, 2008, 54). Input from suppliers' side is seen on decline when R&D departments from within the companies in the industry have emerged (cf. GALIZZI and VENTURINI, 2008, 55). One part of the companies' activities should ensure the availability of financial resources, the R&D activities should stick to products' further improvement and totally new topics (cf. GALIZZI and VENTURINI, 2008, 57). As mentioned, the consumer longs for innovative and new products of which he is attracted (cf. GALIZZI and VENTURINI, 2008, 58).

New products, looking and tasting completely different from well-known, cause consumers' distrust; Adjusting and improving products is the common way for food proces-

Table 2: Innovation culture in the food and beverage sector

Focus	Result
Size	More resources for R&D in bigger companies than in small ones (cf. RAMA and TUNZELMANN, 2008, 14). No bias (nor positive, nor negative) for very large or very small firms found towards innovations due to their size, but difficulties for smaller ones (cf. RAMA and TUNZELMANN, 2008, 16).
Intensity	Bigger firms might benefit from higher financial budgets (not significant!) (cf. RAMA and TUNZELMANN, 2008, 16). Innovations tend to decline if companies grow; "the bigger – the more" is often true but not a steady function (cf. RAMA and TUNZELMANN, 2008, 18). Innovation rate sinks, when companies get too big (cf. RAMA and TUNZELMANN, 2008, pp. 18).
Strategics	Expenditures in R&D require a good marketing department and positive sales figures (cf. RAMA and TUNZELMANN, 2008, pp. 19). Bigger companies might be advantaged due to higher marketing budgets (not significant!) (cf. RAMA and TUNZELMANN, 2008, pp. 19).
External influence	Spread of technologies brings new ways of production, mostly from supply side (cf. RAMA and TUNZELMANN, 2008, 23, pp. 39). Chemical industry is seen as an important source of ideas and innovations (cf. RAMA and TUNZELMANN, 2008, 24). More technologies from local and regional partners (support and communication), the partners in the supply chain benefit, too (cf. RAMA and TUNZELMANN, 2008, 27).
Market	Innovation is seen to profit from high market shares of the company (cf. RAMA and TUNZELMANN, 2008, 29). Success seems to initiate more R&D activities (cf. RAMA and TUNZELMANN, 2008, 30).

sors (cf. GALIZZI and VENTURINI, 2008, pp. 58). As the authors have found, adding or improving features to an existing product on the market meets consumers' demands most, this is the way most of the innovation in the food sector happens (i.e. incremental innovation). (cf. GALIZZI and VENTURINI, 2008, 60). The case of functional food is managed by introducing the products labelled with an existing, well-known and accepted brand (cf. GALIZZI and VENTURINI, 2008, 60). Influence on food and life sciences come from associated research fields: processing technology and latest knowledge for example in biology or chemistry (cf. GALIZZI and VENTURINI, 2008, 61).

Such habits form a market with products pushed into it – else there are low market shares and the development costs cannot be passed over to the consumer (cf. GALIZZI and VENTURINI, 2008, 62). The authors conclude that the factor technology is minor to the extension of existing products which make the costs for new products below average of other branches (cf. GALIZZI and VENTURINI, 2008, 63). WINKELMANN (2010) calls those type of products "fast moving consumer goods", the name reflects the big amount of routine during the buying process (cf. WINKELMANN, 2010, 5).

Consumers with continuously shifting eating habits are the reason why products have to be adjusted to remain successful in business (cf. GALIZZI and VENTURINI, 2008, 63). The nature of innovation here is described as stepwise adding and improving a product and its features to recent discovered trends (cf. GALIZZI and VENTURINI, 2008, 63). Both strategies, innovation as well as differentiation, have to be linked within a company (cf. GALIZZI and VENTURINI, 2008, 63). It seems just a logical consequence strictly sticking to the consumers' desires: the more you know about general tendencies during the project, the better you fit into the market (cf. GALIZZI and VENTURINI, 2008, 64).

It is not easy to tell about rates and shares of new products within the industry (cf. GALIZZI and VENTURINI, 2008, 65). So GALIZZI and VENTURINI suggest that none of the indicators used in other fields to measure the intensity of innovation maps the situation in an adequate way for the F&D industry (cf. GALIZZI and VENTURINI, 2008, 65). Multidisciplinary proceedings should be able to deal with this complexity (cf. GALIZZI and VENTURINI, 2008, 66). Smaller firms due to more flexible structure to counter market developments and shifts in consumers' needs seem to be advantaged (cf. GALIZZI and VENTURINI, 2008, 67).

The food industry itself has to cope with recent trends in globalization and its outcomes (cf. GALIZZI and VENTURINI, 2008, pp. 68). Private labels have managed the struggle from underdog to a real alternative in customers' choice by price or quality strategy (cf. GALIZZI and VENTURINI, 2008, 69). Further retailers can provide an alternative to national brands to the consumer (cf. GALIZZI and VENTURINI, 2008, 69). For suppliers and manufactures this development adds a dimension to competition (cf. GALIZZI and VENTURINI, 2008, 70). Store brands need to take serious their opponents as they get confronted with pricing strategies as well as quality oriented variations (cf. GALIZZI and VENTURINI, 2008, 72). Manufacturers of national brands need to concentrate on their specialities, for which they are known, to ensure their position (cf. GALIZZI and VENTURINI, 2008, 73). It's the retailers, too, who have to be accounted for this development (cf. GALIZZI and VENTURINI, 2008, 75).
Especially on the food market the growing strategic importance of private labels for retailers is noticed (cf. HAAS and WEAVER, 2010, pp. 576).

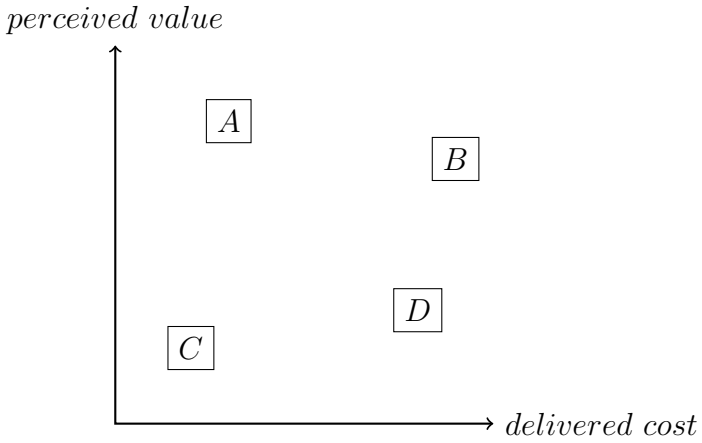
2.7 Interactions between consumers and companies

Positions and Competition In well-off societies most markets are saturated or even oversupplied: Growth, as a consequence, rather happens in aspects of quality (cf. GRUNERT et al., 1996, 1). The food market itself got more competitive as trade barriers get lowered, subsidies were cut and the structure turned towards an oligopoly one (cf. GRUNERT et al., 1996, 1). Additionally, consumers' demands have never been more unsteady, more fractured and less predictable as today (cf. GRUNERT et al., 1996, 1).

GRUNERT et al. identified a competitive advantage for those companies that reliable supply the market with goods fulfilling customers' demands better than the others'.

As shown in figure 3, company B's position is superior to the others', no matter A and D are better than C, but between A and D it depends: if customers demand products with high value associated, A has the advantage, else it is D (cf. GRUNERT et al., 1996, 4). The perceived value results from a company-specific combination of "skills, resources, and competencies" (GRUNERT et al., 1996, 5) – the production factors. Those grouped into three parts are constantly changing and varying in their amount, as for example, new technologies developed will spread among the opponents (cf. GRUNERT et al., 1996, 6).

Figure 3: Value, costs and advantage from positioning



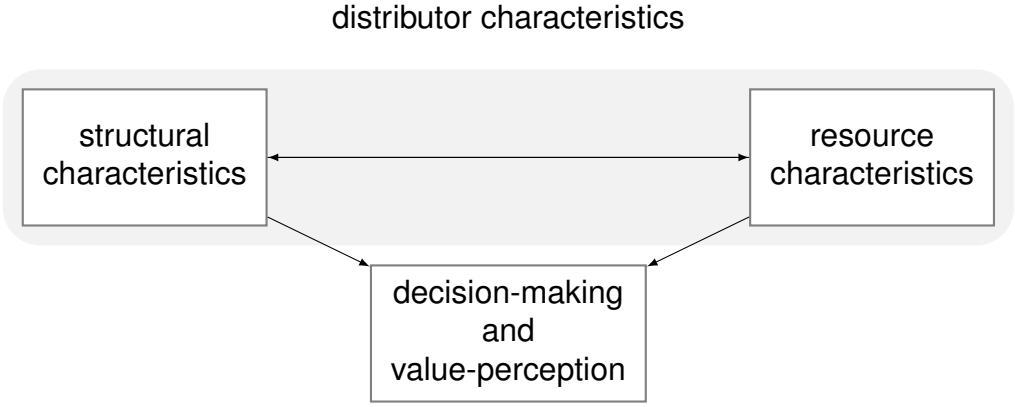
Market orientation For a company there are two possible perspectives to shift and react: How customers perceive the value of the product and how this changes over time (cf. GRUNERT et al., 1996, 9). For a company, this means focussing on two things: getting information from the market and response accordingly to eventually changed circumstances (cf. GRUNERT et al., 1996, 9). Most companies accumulate information about their opponents' activities, e.g. pricing, new products and market shares, but do not tell about their own activities in this field (cf. GRUNERT et al., 1996, pp. 14). Information about the customer is not very deep and acquaintance of information happens mostly by accident or when an explicit project is launched (cf. GRUNERT et al., 1996, 15). As generating information is part of short-term activity and reacting towards others' activities, a-changing trends cannot be identified so easy (cf. GRUNERT et al., 1996, 17). If a company tries to be more market oriented this can just be the result of a continuously link to the market: over time, there flows constantly information back to the company which adjusts their products then (cf. GRUNERT et al., 1996, 17).

Accumulating information Food companies' information source is the market, where actors, circumstances, short-term and long-term trend can emerge and should be recorded by a market intelligence system (MIS) processing those inputs that the company can identify changing or emerging trends, shifts in customers' values and adjust their assortment accordingly (cf. GRUNERT et al., 1996, 20). The information provided by the MIS has to bear a high predictive power – validity is required to understand how the changes can be counteracted and that a company's reaction really has an influence towards the changes (cf. GRUNERT et al., 1996, 21). But decisions have to be drawn not only according those information, the marketing theory provided by scientific

research has to be considered as well (cf. GRUNERT et al., 1996, 22).

Distributor Distributors can be analyzed in the same way, the difference is but regarding not individuals than aggregate levels of the characteristics (cf. GRUNERT et al., 1996, 26). The distributor can be regarded by structure and resource but have to make decisions and weigh the values.

Figure 4: Variables influencing the distributor

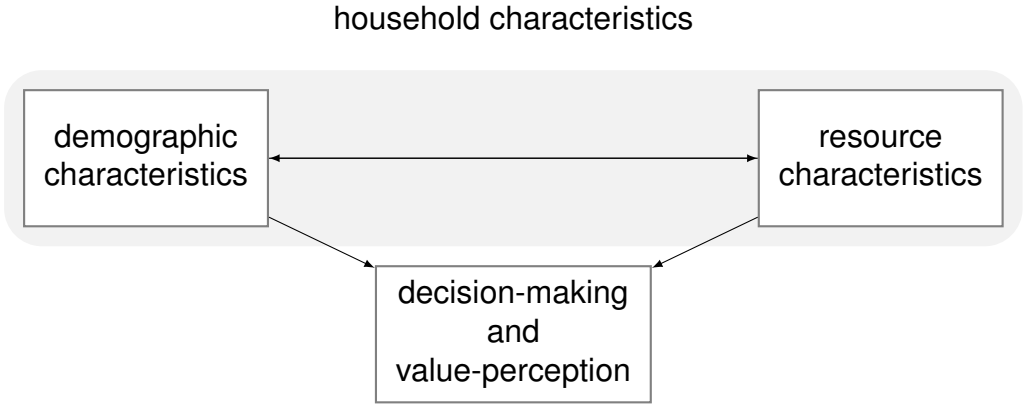


2.8 Consumer

The consumer's perspective on a product's value and their decision making are influenced by two interacting characteristics determining the household (cf. GRUNERT et al., 1996, 24). Each person takes information with his or her senses from the environment that get interpreted and compared by immanent cognitive structures of the individual (cf. GRUNERT et al., 1996, 25). The interaction of cognition with the integration process within the individual and finally there could be recorded a change in behavior (cf. GRUNERT et al., 1996, 25). For example due to the struggle between employment, free-time activities and necessary work in the household, the time available for cooking declines and there is a demand for convenience products reducing time for meal preparation (cf. GALIZZI and VENTURINI, 2008, 52). Figure 5 shows this conflict.

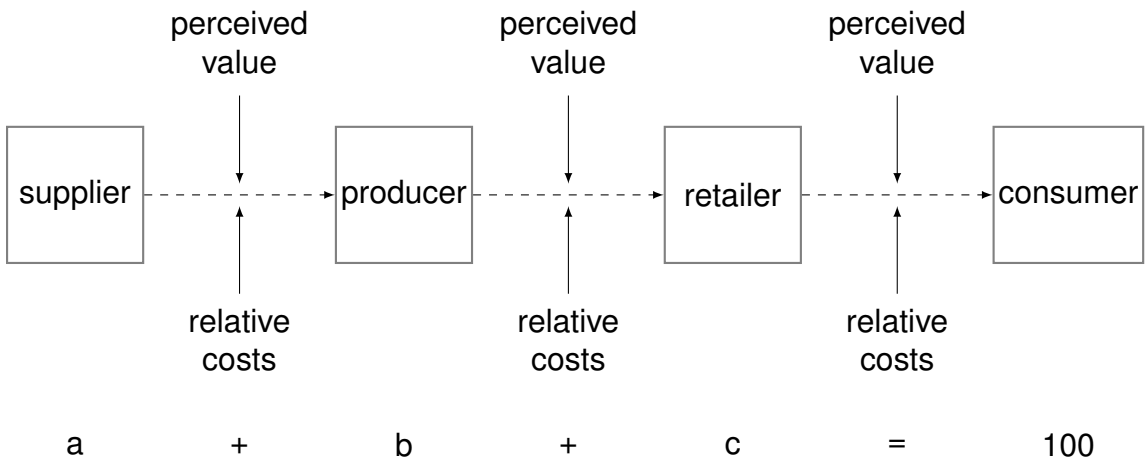
Consumer at an aggregate level The following graph shows the dependencies in the food chain from supplier to consumer and is adopted from GRUNERT et al. (1996, 29). Although the consumer does not interact directly with all the partners involved in the food supply chain, he has a certain influence on them: A shift in preference, perhaps due to negative public relations or a food scandal, can have severe effects on

Figure 5: Variables influencing the consumer



the companies (cf. GRUNERT et al., 1996, 29). The breakdown of the price is meant to be as an example how the retail price emerges and often it indicates the retail price's shares among the food chain (cf. GRUNERT et al., 1996, 29).

Figure 6: Food chain and value



From household size to European regions As seen in figure 6, return depends on the amount the seller is able to add value to the product sold (cf. GRUNERT et al., 1996, 30). Market research, values and trends in society need constantly observation to be at the spot (cf. GRUNERT et al., 1996, 30). This information collected can be used for (cf. GRUNERT et al., 1996, pp. 30):

- Market strategies are formulated according to knowledge about consumers' motives influencing him during shopping. Cooking and eating habits play their roles as well as what they are eager for when they are consuming.

- Consumers differ across markets and culture, the more information a company has, the better a new product can be adjusted.
- Be close to the customer over time is the way, trends can be detected and information can be used for further development.
- Understanding the customers appreciation for a product in a niche market can be transferred on bigger, even cross-border projects.

Household and econometric theory Another point discussed in science is if the choice depends on resources, the economists' perspective roots on models developed by behavioral sciences (cf. GRUNERT et al., 1996, 31). The first position says that consumers with a high household budget and stressful lives look for products that do not require even more time and people with less income, even having more time for cooking, are shopping cheap food (cf. GRUNERT et al., 1996, 31). The second position, related to behavioral sciences wants to identify if and in which amount, attitudes, opinions and the concept of lifestyle influences choice behavior (cf. GRUNERT et al., 1996, 31).

The theoretical approach for describing household is shown as follows according to GRUNERT et al. (1996, 32).
Each household rules over his monetary or product inputs, x_i and time t_j to combine the two factors for outputs Z_k:

$$Z_k = f(x_1, x_2, \dots x_n; t_1, t_2, \dots t_m)$$

Maximizing the utility function is the achievement leading to the highest level of satisfaction (cf. GRUNERT et al., 1996, 32):

$$U = f(Z_1, Z_2, \dots Z_p)$$

The total income I is restricted to price and quantity of the products and the time T is restricted to that spent on work t_w as well as on other activities in the household (cf. GRUNERT et al., 1996, 32):

$$I = \sum x_i \, p_i$$

$$T = t_w + \sum t_j$$

This model can be applied to any field of a household's activity due to its universality (cf. GRUNERT et al., 1996, 32). This construct was affected by two developments in the last century: Women started having jobs, as a consequence the available time at home shrunk down and the households' income grew (cf. GRUNERT et al., 1996, 33). Households can be classified according their use of different types of food, which are each at a certain level still raw or already primed (cf. GRUNERT et al., 1996, pp. 33):

- non-convenience
- semi-convenience
- convenience

GRUNERT et al. (1996) attempted to bring up clusters of regions for the EU food market – whether part of a country or trans-national – where the attitude towards food is similar (cf. GRUNERT et al., 1996, pp. 36). Nation states tend to be rather homogeneous, but there are exceptions, too (cf. GRUNERT et al., 1996, 42). Austria is found in a cluster with Germany and Switzerland and following points characterizing them (cf. GRUNERT et al., 1996, pp. 44):

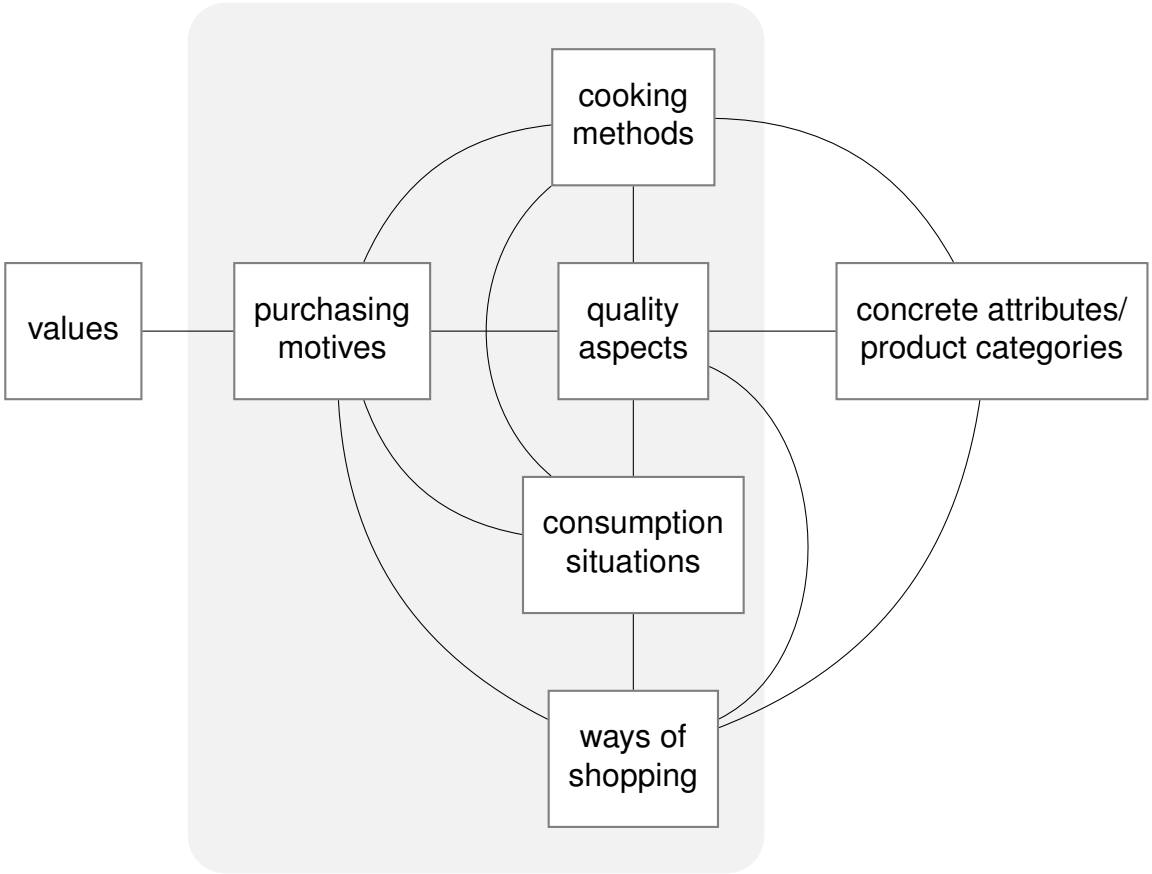
There is a tendency to buy healthy food – fresh food, vegetables, cereals – and healthy beverages – infusions and mineral water; strong alcoholic beverages rather get avoided (cf. GRUNERT et al., 1996, 44). Consumers often follow dietary patterns, e.g. low fat products, but like food (cf. GRUNERT et al., 1996, 44). The author sums his findings up that in this cluster the people with the highest consciousness in food are found (cf. GRUNERT et al., 1996, 45).

Lifestyle and food: Results GRUNERT et al. (1996) describes the consumer in a way that the consumption of food is more but calories intake: having a good time with the family, friends, pleasure with cooking etc., are factors that lead to an ongoing influence on the behavior (cf. GRUNERT et al., 1996, 46). The reasons why people buy things are tried to be described by the theoretical construct of self-relevant consequences which attempt to identify the motives behind the purchase, e.g.: food – hunger (cf. GRUNERT, 1995, 171). The means-end chain model describes how the values and self-perception of a person lead to motives and observable action that make him buy products, supporting the accomplishment of the motives by certain product attributes (cf. GRUNERT et al., 1996, pp. 47). The whole context of a person gets narrowed by intrinsic and extrinsic motivation from society that make him buy a product fitting into

this chain (cf. GRUNERT et al., 1996, pp. 47). The pathway which guides the consumer to his decision can be compared to a ladder with its steps that correspond to different levels where he gets influenced or has to consider new and additional information (cf. GRUNERT, 1995, 172). Such ladders are called hierarchical value maps and help to identify the motives behind a buying process (cf. GRUNERT, 1995, 172).

Cognitive structure behind this process can be of two types: declarative or procedural (cf. GRUNERT, 1995, 173). The first one is easier to measure, as it refers to available information that is easy to communicate (cf. GRUNERT, 1995, 173).The second type is not as easy to explain. The author identifies two appendages: shopping and meal preparation, both are not so clear to observe so describing the result can only be on attempt (cf. GRUNERT, 1995, 173). The following graph tries to connect those different levels of jurisdiction, an extended means-end model (cf. GRUNERT et al., 1996, 48).

Figure 7: Food model and lifestyle



Lifestyle and food: Groups Figure 7 shows the complexity and different connections among the various layers inside a human, the interference of different levels has to be analyzed until the valuation of a product category becomes obvious (cf. GRUNERT et al., 1996, 49). Further, the author suggests to ignore the traditional segmentation of customers: consumers are focusing on a few product categories which they are, by what reason ever, attracted to and in the remaining categories the shopping can be described rather as randomly (cf. GRUNERT et al., 1996, 50).

Having a closer look at a region, shows that Germany, Austria and Switzerland can be clustered together (cf. GRUNERT et al., 1996, 50):

- **Shopping** is mainly influenced by information and pricing, that from advertising seems to play not that important role and planned decisions as well as spontaneous purchases are seen as a necessary activity to cope with (cf. GRUNERT et al., 1996, 53).
- **Quality** is associated with freshness, the price/quality ratio, as well as the avoiding of added substances (cf. GRUNERT et al., 1996, 53). People are curious about new recipes and unknown or products which are new to the market (cf. GRUNERT et al., 1996, 54).
- **Cooking & Consumption** has to be split into groups: A major group has consuming and preparation habits like the classic model; between two minor groups: one accessing quick and easy, pre-prepared meals exists one more, celebrating cooking at home: recipes, ingredients, technical equipment, etc. (cf. GRUNERT et al., 1996, 54). Structured days according to the mealtimes are commonly accepted (cf. GRUNERT et al., 1996, 54).
- **Purchase motives** replaced satisfying hunger as motive to buy food: Consumers seek for a type of self-expression and try to back up their position in society according certain shopping habits (cf. GRUNERT et al., 1996, 55).

By those categories, the population can be split into five segments with their main characteristics:

1. *The uninvolved consumer (21%)* is neither interested in nor searching for aspects of nutrition or cooking food (cf. GRUNERT et al., 1996, 55). Price matters to them at an average level (cf. GRUNERT et al., 1996, 56). Whatever they look for in their

lives, it is found in a transcendent aspect but food or eating (cf. GRUNERT et al., 1996, 56).

2. *The careless consumer (11%)* differs not very much from the first but if there is a new product, this group longs for it and is right on the move to buy it (cf. GRUNERT et al., 1996, 56).

3. *The conservative food consumer (18%)* wants to be informed but dislikes advertising and shopping in general (cf. GRUNERT et al., 1996, pp. 56). The traditional shopping with a written list, the same ways in cooking: it is the wife's job to prepare meals according to classic recipes (cf. GRUNERT et al., 1996, 57).

4. *The rational food consumer (26%)* shops considerate: New products get noticed and adopted when the expected gain in value is high enough (cf. GRUNERT et al., 1996, pp. 57). The members define their life through all the things that go along with the choice, cooking and eating healthy, ecological food (cf. GRUNERT et al., 1996, 58).

5. *The adventurous food consumer (24%)* focuses on new products, too. Cooking with the latest gadgets, eating with friends and endless time for preparation is seen as a social activity for the family, too (cf. GRUNERT et al., 1996, 58).

Lifestyle and food: Individuals The idea behind food quality – the measures and concepts are due to absent definitions rather blurry – should be approached by a set of different tools recording several aspects in order to localize its outlines (cf. GRUNERT et al., 1996, pp. 75). Breaking this concept into four parts let them define much better (cf. GRUNERT et al., 1996, 76).

1. Physical parameters, any substance that can be measured is noted in the physical parameters.

2. Process-associated features due to production or processing.

3. Quality and its control can be proceeded at different levels and informs about the stability of the two levels mentioned.

4. User oriented quality – by contrast a subjective perceived quality – is not a consistent measure as it can differ from one to the other.

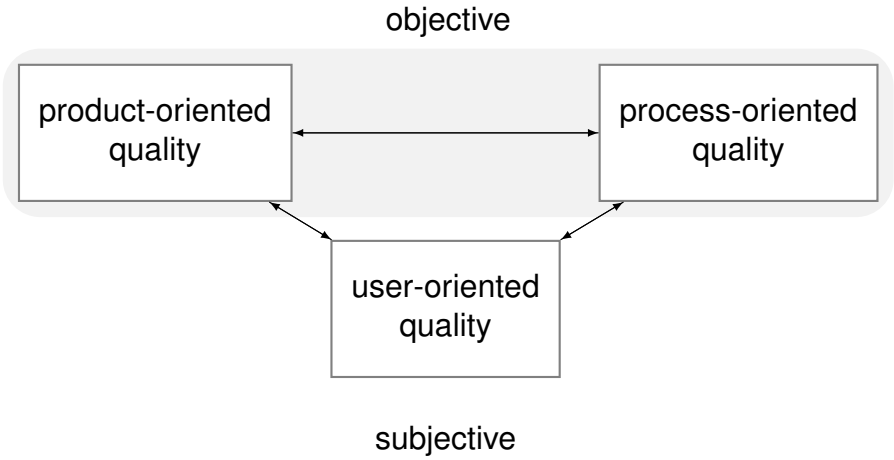
2.9 Food quality and demand for safety

Food safety can be interpreted as objective or subjective safety, whereupon the first is based on scientific and expert approach, the second is what consumers bear in their minds (cf. GRUNERT, 2005, 381).
As GRUNERT (2005) describes, the issues on quality and safety in the food market have experienced a remarkable growth in the last decade: Food scandals, grown interest from many parts of the society and the evolution of the consumer who is not only interested in calories but ethic production, health aspects, pricing and choice – just to mention a few examples (cf. GRUNERT, 2005, 369). As pricing is just one strategy to increase revenues, this extends have become more and more viewable (cf. GRUNERT, 2005, 369). This focus on customer led towards an environment, where the customer cannot convinced by efficiency, the resulting lower price and controlled quality: added value is the buzz-word at present time (cf. GRUNERT, 2005, 370).

Especially the aspect of product quality has grown in consumer's mind: the well-known chain from farm ongoing to the processor and the selling by retailers is summed up together as chain that provides quality and safety (cf. GRUNERT, 2005, pp. 370). Here it can be identified, what customers are willing to pay for the quality level, this is the demand side (cf. GRUNERT, 2005, pp. 370). Besides, there are existing two more pillars: The second one can be dedicated to the supply side of the food chain, the place where documentation plays an important role, e.g.: in case of a food scandal, when transparency is needed to identify the critical points (cf. GRUNERT, 2005, 371). How the consumer perceives the levels in quality and safety, the communication of both pillars presented, is the third one (cf. GRUNERT, 2005, 371). GRUNERT concludes that the food market will face a development towards an increased interdependence, farmers and processors have to deal with in order consumers' demands (cf. GRUNERT, 2005, 386). In the end, consumers have to weigh on their own, what aspect of life and food to focus and what to buy according their economic resources (cf. GRUNERT, 2005, 385).

Figure 8 shows the dependencies between the different viewpoints, quality can be defined upon (cf. GRUNERT, 1995, 171): product-oriented features correspond to its natural qualities, but can vary, e.g.: natural fat content in milk, process oriented qualities are measurable, stable parameters. User-oriented perception is always subjective (cf. GRUNERT, 1995, 171). Both fields, dividing quality into an objective (measurable) and subjective part (evaluation after experience) (cf. GRUNERT, 2005, 371). Only if the

Figure 8: Perception of food quality



transmission of ideas, knowledge and information works, each side is satisfied and can profit from efforts (cf. GRUNERT, 2005, 372).

Another field still remaining blurred, deals with the inferences among different parameters in a product that are regarded to have an influence on e.g.: quality – labelled "organic" means "healthier" (cf. GRUNERT, 2005, 376). Three indicators have been regarded as being perhaps relevant in this case and could be used as a hint for quality: "brands, cues related to product origin, and quality labels" (GRUNERT, 2005, 377). But quality labels are a delicate thing, there are some points to be mentioned (cf. GRUNERT, 2005, 378):

- Some are very specific, and it is not clear for what they are used on the product.
- Often it remains blurry if the label was awarded by a governmental organization or by the manufacturer.
- And there might be as well a share of them totally ignored.

Nonetheless it is necessary to have a label on a high quality product as the added value would not be communicated at all, a classic double bind for manufacturers (cf. GRUNERT, 2005, 378).

Food Safety Those attributes and information getting communicated have to come from sources which own people's credibility and vice versa the consumer has to be

able to process the additional information (cf. GRUNERT, 2002, 280). Of course people have to be more interested in information, making further investigation possible (cf. GRUNERT, 2002, 280). The author found that food safety is not presented in a comparable homogeneous way what may cause irritation on consumers' side (cf. GRUNERT, 2002, 284). Consumers do not react in a predictable way towards food scandals and the contribution of consumers' social group needs more investigation (cf. GRUNERT, 2002, 284). During a food scandal customers' attention on safety issues seem higher and afterwards it returns to a normal amount (cf. GRUNERT, 2002, 284).

Summary

In this chapter starting point was the food industry by figures in the EU. Then the turn was towards the consumers. They are longing for new products in their daily lives. How different motives from various backgrounds influence them was shown in the "Total Food Quality" model. The literature research showed that there is not one consumer or a few groups, but a huge variety of different personalities. The task for the companies is to know their target group's needs.

3 Fresh Milk – Buying motives, Perception

In this chapter the research objective fresh milk is focused: Starting point is its position on Austria's food market. The buying process and inherent motives from consumer's perspective occurring during food-shopping will be analyzed, too.

3.1 Austria's market for fresh milk

Milk and its processed products are an important factor in Austria's food market as PICHLER (2009) concludes from an overview: This product category accounts for about 9% of all food retailers' sales figures (cf. PICHLER, 2009, 9). According to the outlines of EUROPÄISCHE GEMEINSCHAFT, fresh milk is the the non-treated (e.g. heat) product of farm animals (EUROPÄISCHE GEMEINSCHAFT, 2004, s.p.). Of course, fresh milk in shops is treated in specified ways to ensure acceptable transport and storage without negative effect to the product. EUROPÄISCHE GEMEINSCHAFT calls them dairy products which corresponds to the german word: "Milchprodukte" (EUROPÄISCHE GEMEINSCHAFT, 2004, s.p.).

The total production of dairy milk in Austria reached a level of 2.71 mio. tons in 2009 (cf. LEBENSMINISTERIUM, 2010, 8). A typical Austrian consumes 80.2 kg of milk and 30 kg of further processed milk products (e.g. cheese) per year (cf. PICHLER, 2009, 19). Consuming milk and processed products is regarded as one of the most important sources for the necessary calcium intake (cf. PICHLER, 2009, 19). Further to have an positive effect on the health of bones (cf. PICHLER, 2009, 38).

AMA (2009) published figures for Austria's food markets and summarized the results concerning milk and dairy products in a detailed report: In 2009 there was an overall production of milk and dairy products in sum of 1,021,225 tons (cf. AMA, 2009, 5). The per capita consumption of fresh milk in 2008/09 reached 92.1 litres according to STATISTIK AUSTRIA (cf. LEBENSMINISTERIUM, 2010, 31). Concerning the fat content the products on the market for fresh milk two numbers can be found frequently: 3.5% and 1.5% (cf. AMA, 2009, 13). This was backed up by a store-check in Vienna, attached in the annex.

Austria's customers tend to buy rather products from Europe or their home country than products from abroad (cf. SCHWEIGER et al., 1999, 167). Further the LEBENSMINISTERIUM shows that for food regional origin is very important (cf. LEBENSMINISTERIUM, 2010, 32). STOCKMEYER and WEINDLMAIER's report focuses on innovations

in the fresh milk industry. The enterprises were asked on their policy concerning fresh milk and the following three points were the most important to them (cf. STOCKMEYER and WEINDLMAIER, 1999, 7):

- Being innovative is a credo for all enterprises and the companies' activities are grouped to support that process.
- Only one half of all new products introduced would be labelled as success.
- Developing a new product requires a nine–month period.

3.2 Food shopping

Concerning food, due to a high shopping frequency buying is an act characterized by routine: food shopping decisions are more or less drawn as auto-decision. Further, products are likely to be perceived in an subjective way (cf. STRECKER et al., 1976, pp. 45). The real product is always confronted with the image the customer has developed from the product in his head (cf. STRECKER et al., 1976, 45). So buyer decisions are drawn according to his image, which emerged from psychological processes and product-experience and can change by new information (cf. STRECKER et al., 1976, 46). The change of this product image is called irradiation and is able to change both: product image and the company's image (cf. STRECKER et al., 1976, 46).

In the food sector a low price level is a widely applied selling proposition by the retailers, consequently the customer does not overreact just because of the advertising (cf. DILLER, 2001, 55). The buying process is only influenceable when the price level is low by numbers and customers' perception (cf. DILLER, 2001, 55).

According to HAEDRICH et al. (2003) low involvement can be characterized as follows: the amount of information taken to consideration with respect to the product is of small amount and if new information is added it is just in a passive way (cf. HAEDRICH et al., 2003, 28). Consequently the information just considered for a moment do not get remembered for a longer period of time, so the advertising's appeal has to be renewed at the next occasion (cf. HAEDRICH et al., 2003, 28).

Understanding the motives of the customer can be realized by a combination of "approved, consistent, general and precise" (TROMMSDORFF, 1993, 15) models and

theories. Consequently, models that are not easy to understand, precise or reliable are not helpful for decisions (cf. TROMMSDORFF, 1993, 15). Customers are often described as price sensitive with regard to regular bought goods (cf. TROMMSDORFF, 1993, 97).

Changes in society play a big role, too: There is a growing share of small households with two or just a single person living in (cf. NESTLÉ, 2008, 1). As a result, smaller packages will be preferred due to expiry date and storage (cf. STRECKER et al., 1976, 69). Additionally an increasing share of women are working (cf. NESTLÉ, 2008, 1). Consequently we speak of an increase in individualization according the lifestyle (cf. NESTLÉ, 2008, 2). A focus on health as well as a growing interest for the circumstances of the food production gets a wider basis in society (cf. NESTLÉ, 2008, 2). The growing interest for the personal health will create a demand for food supporting it (cf. STRECKER et al., 1976, 71). "New experiences, technological progress and product innovations" (NESTLÉ, 2008, 3) lies in the focus of all groups of society, no matter if young or old. Women exceed the men's interest in food: their demand for ethic guidelines in the production chain as well as preferring organic food (cf. NESTLÉ, 2008, 11). STRECKER et al. (1976) mention the growing demand for information on products and their benefit what he calls "consumerism" and is seen as indicator for a more critical view on products and their production process (cf. STRECKER et al., 1976, 72). Labelled organic is not the most important thing on products (cf. NESTLÉ, 2008, 17). The tendencies show that in respect to nutrition there is a certain trend noticeable which can be described with the increased demand for natural finish, animals that face appropriate living conditions and buying the season's products (cf. NESTLÉ, 2008, 17). The customers' price sensitivity is a behavior with its roots in the rest of society, as it indicates a thoughtful use of financial resources (cf. STRECKER et al., 1976, 73).

Information deficiency SCHWAN (2009) researched on the topic if customers are aware of the variety of quality signs existing and getting printed on food. Intention for any label communicating quality is to distinguish products sold by your opponent (cf. SCHWAN, 2009, 110). The surplus of such signs is seen that they, often awarded by semi-governmental institutions, have a law basis and get controlled according to it and get not misinterpreted so easy (cf. SCHWAN, 2009, 110). Disadvantage can be found here, too. As those signs are numerous, they tend to confuse the customer instead of simplifying the decision process during food–shopping by providing information (cf. SCHWAN, 2009, 114).

Consumers are often confused or do not exactly know where a product and his ingredients is from due to a deficiency in geography or knowledge in food cropping (cf. SCHWAN, 2009, 117). Additionally the "anonymity of the producer" (SCHWAN, 2009, 117) was a critical point that got mentioned. Concerning origin, 95% of all customers want better information (cf. SCHWAN, 2009, 117) and seven out of ten customers prefer to read who has produced a good instead of blurry statements (cf. SCHWAN, 2009, 117). In addition those declarations of origin need time until they get recognized and connected with their attempt of communication (cf. SCHWAN, 2009, 261). Ongoing SCHWAN (2009) adds, that there unfortunately is only a minority among customers who really have profound knowledge and can be called "informed customers" (SCHWAN, 2009, 267). The minority mentioned knows a lot about production as well as has knowledge in cooking and the effects of dietary patterns on your health (SCHWAN, 2009, 263). Labels telling for example produced according organic practise, are a possible aid but a lot of information remains untold (cf. SCHWAN, 2009, 264).

Concerning fresh food the consumers emphasize the origin and freshness of the products and buy according to geographical indications of source (cf. LEBENSMINISTERIUM, 2010, 32, 135). Products from the origin the customer comes from are favored and there is a tendency to buy those which are cultivated seasonal (cf. LEBENSMINISTERIUM, 2010, 32). It is regarded as likely that this way of action has intensified since the world's economy is on decline in the recent years (cf. LEBENSMINISTERIUM, 2010, 135).

Regional origin BALLING researched reciprocal effects, declarations of origin induce and how strong the word "region" affects the buying motives of the customer (cf. BALLING, 2004, 67). The results of the study can be summarized as following (cf. BALLING, 2004, pp. 67):

- When a product is labelled "regional" this declaration bundles a lot of probably important information for a customer's buying decision.
- Emotions and feelings get associated with, further the aspect of perceived quality is emphasized.
- Labels as triggers to buy a product can help to create a loyal customer that will continue in buying the product.

In our globalized world insecurity and anonymity are on the increase and it seems that smaller regions' image on products gets more important due to available emotional connotations (BALLING, 2004, 69). Further there can be recorded an increase of importance of regional labels: the more detailed they are, the more important they get (cf. BALLING, 2004, 78). The image of a region gets transferred on the product and when the region is famous for a special treatment for products this is likely to happen with any product carrying the label of the region (cf. BALLING, 2004, 71). This concept is even more striking when regarding products being not processed so much (cf. BALLING, 2004, 70). As BALLING concludes from his studies on the origin of food, he mentions that Austria's "AMA" is a good example for the integration of the two concepts "region" and "quality labelling" because it is relative widely known among Austrians (cf. BALLING, 2004, pp. 76).

Those who connect regionalism with sustainability and refuse to exploit resources are showing responsibility for the current as well as following generations what helps attracting consumers that tend to be critical (cf. SOLOMON et al., 2001, pp. 34).

Regarded from neutral point, milk faces one big problem: Unfortunately, it belongs to a food category where the products do not bear a lot of possibility of differentiation; Homogeneity characterizes them (cf. STRECKER et al., 1976, 261). Resulting from this, the USP, the features giving extra satisfaction to the customer are hard to identify, the pressure concerning price is high and the margins for the enterprises are quite low (cf. STRECKER et al., 1976, 261).

SOLOMON et al. come to a similar conclusion: products from foreign countries are not valued by the customer as good as those from the home country (cf. SOLOMON et al., 2001, 270). Further products from industrialized countries are rated superior to those from developing countries (SOLOMON et al., 2001, 270).

3.3 Studies on fresh milk

MEIXNER (2000, sp.) researched on the topic of variety seeking in food shopping. He found that almost 90% of the customers do not seek variety among fresh milk and tend to buy the article they are used to (cf. MEIXNER, 2000, sp.). The shopping habits of fresh milk were recorded as following (MEIXNER, 2000, sp.):

- 5% shop milk daily.
- One fourth buys it at least three to four times a week.
- 38% once or twice a week.
- Very irregular, seven per cent, and twelve per cent do not buy fresh milk at all.

Shelflife is one features according which the product category fresh milk can be grouped. A study done by BRINKMANN and KUHLMANN in the 1980s summarizes the advantages of milk with an extended expiry date: "convenience, shelf life, autonomy and benefit/cost ratio" (BRINKMANN and KUHLMANN, 1983, 1050).
A consumer study, conducted in Germany from the year 2008 sees the following points as considerable (cf. GRASSL and SCHAAL, 2010, s.p.):

- Branding and the product's label.
- No preference for discounters to shop milk.
- No abuse of bargain power by the manufacturer and seller as well as fair circumstances in production.
- An environmental friendly production.
- Rather preference for products labelled "organic".

Health issues The aspect that of positive influence on health is seen to be an important point for the marketing strategies in this field (cf. PICHLER, 2009, 50). A product being both, healthy and valuable is seen as challenge to be successful on such a highly competitive market (cf. PICHLER, 2009, pp. 50). This connection between health, valuable and well-balanced diet is the reason for the special position of milk (cf. PICHLER, 2009, 114).
The most important criteria to buy milk are seen to be: freshness, shelf life and expiry date (cf. PICHLER, 2009, 66). To advertise for a product, you need to know the consumer's attitude towards it (cf. PICHLER, 2009, 66). As milk is a typical low-involvement product, more emotional campaigns and advertisements are occurring (cf. PICHLER, 2009, 66).
Intensified reflection of eating habits, increased sensibility for information on food on customer's side meets a variety of information provided by manufacturer and unfortunately the consumer is left irritated and made insecure (cf. PICHLER, 2009, 114).

Single results have to be put into the whole context of eating instead of an unconsidered change of the consumers food patterns and diets (cf. PICHLER, 2009, 114). The positive image of milk and its connection with positive health relation is unquestioned an important reason for consuming milk (cf. PICHLER, 2009, 115).
The intake of calcium by consuming milk should be increased, what PICHLER concludes from her study and researches on the food science sector (cf. PICHLER, 2009, 175).
Austria's consumers see a high contribution of milk to the individual's health, two-thirds of the interviewees in a study connected milk with this aspect. The health image is not a fixed thing but differs with respect to each target group of consumers (cf. PICHLER, 2009, 181). Specific communication especially on critical points, e.g. studies telling about dangers of consuming milk, need to be counter-react considerate and profoundly (cf. PICHLER, 2009, 181).

DEIX (2009) researched on the image of milk products from other livestock: sheep and goat (DEIX, 2009). Consumer interviews reported a close connection to natural finish, taste and good effects on someone's health (cf. DEIX, 2009, 72). Additionally the circumstances of the production seem to play an important role for the buyers which are characterized as being health oriented and more or less hedonistic (cf. DEIX, 2009, 72). Further the author found that there is a strong connection between the product and environmental factors and the living conditions of the animals: pasture, grazing animals, ... (cf. DEIX, 2009, 73). Probands in this study seem to be convinced of dairy products from other species than cow are more digestible for them (cf. DEIX, 2009, 74). Additionally the interviewees associated less treatment with this product alternative to dairy milk from cow (cf. DEIX, 2009, 74). For the NPD this could be an interesting field of activity, as people connect this alternatives close to health or influences on the health by consuming them (cf. DEIX, 2009, 74). Further, the trend towards regional and small production units seem to be transmitted very good by such products (cf. DEIX, 2009, 84).

MEINDL (2009) had a closer look on functional food criteria MEINDL (2009). The most important buying motive is seen in health issues and as a result, consumers should feel better and experience a shift towards more physical power for their activities (cf. MEINDL, 2009, 64). Not only the characteristics named, but pleasure is additionally to mention when talking about dairy products (cf. MEINDL, 2009, 64). The author

found evidence in her study that taste is a very important factor contributing to the overall perceived benefit of the product (cf. MEINDL, 2009, 120).
The demand for products labelled "Heumilch" grows constantly in Austria: Sales rose 21% by share and reached 69 mio. Euro turnover in 2011 (cf. N.N., 2012, s.p.). Due to marketing activities about the share of recognition is about 85% (cf. N.N., 2012, s.p.). This is a continuing trend which already emerged 2010 and 2011 N.N. (2011, s.p.).

Concerning our sample - students aged between twenty and thirty - we mention a result from BALLING who found that regional origin labelled on products are likelier to be bought by older people which do not have A-levels or university degrees concerning their formation (cf. BALLING, 2004, 78).

BRINKMANN and KUHLMANN found that the knowledge concerning milk and its varieties is not well developed (cf. BRINKMANN and KUHLMANN, 1983, 1052). Further terms used in advertising and for example to differentiate varying levels of fat content get misinterpreted or disconnected with other information by the customer (cf. BRINKMANN and KUHLMANN, 1983, 1052).

SCHWAN (2009) examined if customers are aware of the variety of quality signs existing and getting printed on food. Intention for any label communicating quality is to distinguish products sold by your opponent (cf. SCHWAN, 2009, 110). The surplus of such signs is seen that they, often awarded by semi-governmental institutions, have a law basis, get controlled accordingly and are not misinterpreted so easy (cf. SCHWAN, 2009, 110). Disadvantage is due to their number, confusion happens instead of simplifying the decision process by providing information (cf. SCHWAN, 2009, 114).
Due to a lack of knowledge in plant cropping, consumers often do not exactly know the food's or the ingredients' origin (cf. SCHWAN, 2009, 117). Additionally the "anonymity of the producer" (SCHWAN, 2009, 117) is a critical point. Concerning origin, 95% of all customers want better information and 70% prefer to read the producer instead of blurry statements (cf. SCHWAN, 2009, 117). In addition, those declarations of origin need a introducing time until they are recognized and connected with their attempt of communication (cf. SCHWAN, 2009, 261).
Ongoing SCHWAN adds, that there unfortunately is only a minority among customers who really have profound knowledge, the "informed customers" (SCHWAN, 2009, 267). This minority knows well about production and dietary patterns on health, and has skills in cooking (SCHWAN, 2009, 263). Labels telling, eg.: "produced according or-

ganic rules", are a possible aid but a lot of information remains untold (cf. SCHWAN, 2009, 264).

Regional origin In general, products from foreign countries seem to be not valued as good as those from the home country (cf. SOLOMON et al., 2001, 270). Further products from industrialized countries are rated superior to those from developing countries (SOLOMON et al., 2001, 270).

BALLING researched reciprocal effects, declarations of origin induce and how strong the word "region" affects the buying motives of the customer (cf. BALLING, 2004, 67). The results of the study can be summarized as following (cf. BALLING, 2004, pp. 67):

- When a product is labelled "regional" this declaration bundles a lot of probably important information for a customer's buying decision.
- Emotions and feelings get associated with, further the aspect of perceived quality is emphasized.
- Labels as triggers to buy a product can help to create a loyal customer that will continue in buying the product.

In a globalized world, insecurity and anonymity are on the increase, so BALLING (2004) concludes that smaller regions are in consumer's favor: the distances by "emotional and cognitive means get closer" (BALLING, 2004, 69). Further there can be recorded an increased importance of regional labels: the more detailed they are, the more important they get (cf. BALLING, 2004, 78). By carrying the label or the region may be famous for a special treatment on products, the region's image becomes transferred onto the product (cf. BALLING, 2004, 71). This concept is even more striking with products being not processed so much (cf. BALLING, 2004, 70). As BALLING (2004) concludes from his studies, Austria's "AMA" sign is a good example for the integration of the two concepts "region" and "quality labelling" as it is relative widely known among Austrians (cf. BALLING, 2004, pp. 76).

BESCH and HAUSLADEN (2002) researched on the factors contributing in a positive way to the regional aspect in food marketing and claimed a "competitive advantage for regional food marketing" (BESCH and HAUSLADEN, 2002, 81). The work identifies the four following criteria of regional: factor, consumer, cooperation and image (cf. BESCH

and HAUSLADEN, 2002, pp. 76). Both, raw materials and their refinement happen in the same region (cf. BESCH and HAUSLADEN, 2002, pp. 77).

Studies having analyzed the structure of a region with respect to farm to market distance and population density – in other words: their competitive advantages (cf. BESCH and HAUSLADEN, 2002, pp. 77). Cooperation among local institutions create win-win situations (cf. BESCH and HAUSLADEN, 2002, pp. 79). The image of a region it connected with the product and even helps to sell products in areas outlying, as the positive feelings are sold with the product, too (cf. BESCH and HAUSLADEN, 2002, 80).

3.4 Features entering the research

For reliable forecast, following points are recommended (cf. TSCHEULIN, 1991, 1270):

- Stick to a few items which are regarded to have an influence on the customer's preference of a product.
- The number of alternatives, the customer can choose within, has to be restricted to a few ones.

Pre-inquiry The construction of the research design will be made with the help of a pre-test, which was done in mid-november 2011. Pre-tests are carried out in order to identify value-linked attributes and get more information from the customers' point of view (cf. BORTZ and DÖRING, 2006, 359). The interviews were held with respect to get as much quantitative information as possible according to the suggestions in BORTZ and DÖRING (2006, pp. 308) on processing this type of interview. In customer researches this is a very common tool to identify attributes, for example SCHNETTLER et al. (2008). The results of the inquiry are summed up in the appendix. The most important categories for features were - according to the numbers how often mentioned: Organic - Expiry date - Fat content - Origin and Price.
The before mentioned short inquiry to identify possibly unnoticed feature before the final design is suggested by literature (cf. THEUERKAUF, 1989, 1180). A good research design should not exceed the number of nine different product characteristics with their attribute levels (cf. THEUERKAUF, 1989, 1180). No matter if qualitative or quantitative data is collected, both are able to be integrated into each method (cf. THEUERKAUF, 1989, 1180).

The variable "organic" is left out as there might be a bias in unknown amount towards the variable price. The variables entering the research with their attributes are:

- Expiry date: 5 or 14 days from purchase
- Fat content: 1.5% or 3.5%
- Price: 0.89,- 0.99,- 1.09,- or 1.19,-
- Label: national flag of Austria, Heumilch, non GMO, picture showing a cow

An example of the products composed from this information is shown at the beginning of the thesis' second part. The plan how to construct the questionary can be found in the annexe and is based upon the work of STREET et al. (2005).

Summary

The chapter dealt with the research objective "fresh milk". The milk market, its consumption in Austria and consumers' behavior towards this product within the group of "food" was presented in an overview. The four categories within we vary the attributes during the research are "Expiry date", "Fat content", "Price" and "Label". The first two categories bear two-level attributes, the two following have four attributes each to vary.

4 Analytic Hierarchy Process

In this chapter the methodology of the Analytic Hierarchy Process (AHP) is presented. From the method's development, theoretical and mathematical basis, the direction of the chapter focuses the AHP's practical applicability. Results from other studies applying the AHP will be mentioned, too.

The acronym AHP is an abbreviation, and stands for (cf. GOLDEN, 1989, 13):

- **A**nalytic, as the problem is decomposed according to reasonable principles.
- **H**ierarchy, as by decomposing a problem you will come to more and less, dependent and independent variables that get arranged at different levels of importance.
- **P**rocess, as the problem is embed in a network of factors more or less important that have to considered accordingly.

The roots of the Analytic Hierarchy Process (AHP) go back until the year 1973, when professor SAATY combined his theories of structuring a decision process (cf. SAATY, 1996, ix). In recent cases the AHP got applied, too. The method was used to predict U.S. economy's resurgence after its decline in december 2007 (cf. BLAIR et al., 2010, pp. 114). SAATY realized that many of our daily decisions could more or less be described by numbers, e.g. the price of goods and so he found it quite logical to apply this to his process: rank alternatives with numerical and verbal expressions (cf. SAATY, 1996, 3). The strength of the AHP may be that problems can be analyzed very similar to the normal way of human's thinking (cf. DYER and FORMAN, 1991, 75). People applying the AHP regularly, report that the interviewees enjoy applying the AHP (cf. SAATY, 1979, 19).

4.1 Structure of solving a problem

Any problem occurring has a structure more or less similar to the other, consequently you can put this structure in a formal model, which is described following (cf. SAATY, 1996, 4):

1. At the beginning the problem gets identified and described in order to set up a goal to be reached.
2. Each possible solution gets rated and connected with a numerical weight in order to differentiate among them.

3. The alternative regarded as most useful is chosen.
4. Find out which amount of resources are free, or can be added to solve the problem.
5. Analyze what amount of effort is likely to be needed for solving the problem.
6. Plan the actions in order to act systematically.
7. Visualize the problem because in pictures the underlying dependencies can be discovered more easily.
8. Implement indicating device for feedback.
9. Back up proper working of the process during conflict resolution.
10. Adjust the process in order to make it more effective.
11. Solve the problem.

WEBER suggests to split this process into two main parts within the first the project in general gets described and in the second step the solution is designed (cf. WEBER, 1993, pp. 73). This process of structuring a problem is useful as it helps to keep clear dependencies among elements as well as between the different hierarchical levels (WEBER (1993, 50) HAEDRICH et al. (1986, 122). Those structures should have several levels where attributes can be summarized in order to identify those from lower and higher levels (cf. WEBER, 1993, 50). The author points out that the alternatives need to be distinguishable, if not they should be left out (cf. WEBER, 1993, 50).

BARZILAI worked on the decomposition of problems into linear and non-linear value functions. He wanted a framework, using mathematical tools, which are easy to handle but hence produce clear and reliable decisions (cf. BARZILAI, 1998, 159). He concludes that in the end any decision maker has to structure his problems, bring his alternatives in an order with a kind of linear value function (cf. BARZILAI, 1998, 164).

At first an overall goal has to be put on top of hierarchy (cf. HAEDRICH et al., 1986, 121). Then the deconstruction or decomposition and breaking down of the goal into smaller goals begins (cf. HAEDRICH et al., 1986, 121). For those small units it should be easy to formulate tangible actions to reach the overall goal, additionally, all should

be mentioned which might contribute (cf. HAEDRICH et al., 1986, 121).

Setting up a goal increases the precision of your choice task as it helps to identify sometimes completely new solutions for a case (cf. EISENFÜHR and WEBER, 1999, 53). Identifying an aim is something the decisionmaker himself has to develop as aims are the results of ideas (cf. EISENFÜHR and WEBER, 1999, pp. 54). During this design process of new aims, circumstances that generate dissatisfaction have to be named and different solutions need to be compared (cf. EISENFÜHR and WEBER, 1999, pp. 54). Further there is a need to integrate: strategy, external requirements and all affected persons within or without the organization (cf. EISENFÜHR and WEBER, 1999, pp. 54).

After identifying your overall goal, it is useful to split it in a primary target and subtargets in order to find out if it is complete, clear focused and non-redundancy is given (cf. EISENFÜHR and WEBER, 1999, 62). An attribute is an item that can be measured in a certain way, giving you information about having succeeded in reaching an aim (cf. EISENFÜHR and WEBER, 1999, 67).

At this point, the multi-attributive utility model should be mentioned, that assigns a value between 0 and 1 to the attributes k: z^0k or z^1k and the utility function reads as (cf. ROMMELFANGER and EICKEMEIER, 2002, 158): $uk(zk)$

The AHP process can be split into a process consisting of four parts which can be described as follows from ZAHEDI (1986, pp. 96) and MEIXNER and HAAS (2010, 186). In literature there can be found a model with five steps, too, the third step is interpreted as two independent steps (cf. HAEDRICH et al., 1986, 121).

1. Find out about the structure of your decision problem: Try to break it into parts and find out about their relations between.
2. Rate the items: Take two items of the same hierarchical level and weigh them against each other, go on until all items have got a weight from direct or indirect rating.
3. Computation according SAATY's method to get the eigenvector as well as check the parameters indicating inconsistent comparisons.
4. Summarize the weights for the alternatives each in order to come to their ranking.

This process bears the possibility of adjusting as you can go iterative through it: if step three indicates a high inconsistency level in estimating the priorities in step two, you can repeat going through it until you reach an adequate level of consistency (cf. HAEDRICH et al., 1986, 121).
The process itself sounds easy, but it is the decision and its description that makes it difficult: the future is not determined, often there are more goals to follow, the alternatives can be quite numerous and so problems can grow complex really fast (cf. EISENFÜHR and WEBER, 1999, pp. 2). A problem's solution requires its good definition which makes reliable information necessary (cf. EISENFÜHR and WEBER, 1999, pp. 5). Ongoing the future should be interpreted only by reliable data and the decision maker has to be sure of what he wants to reach (cf. EISENFÜHR and WEBER, 1999, pp. 5).

4.2 Hierarchies

There is no guideline how to structure problems into a hierarchy, this has to be done each time anew (cf. SAATY, 1996, 14). After the process of formulating the researcher has learned a lot how the system works and extensions can be integrated very easily so that the structure remains flexible and open to changing conditions (cf. SAATY, 1996, 14). To form the hierarchy and coming to the final one is a process of ongoing reconsideration after which a profound decision can be drawn (cf. SAATY, 1996, 15). Additionally, the visualization of the hierarchy is a point from which great reduction to problems comes from (cf. DYER and FORMAN, 1991, pp. 115) After the problem is structured, the hierarchy is set up, rated, the model established and at least there should follow an analysis of sensitivity (cf. DYER and FORMAN, 1991, 127). But as in many cases here it is important, too, that any hierarchy set up, should be as easy as possible concerning construction and explanation (cf. DYER and FORMAN, 1991, 132). The formulation of aims in a hierarchy puts the overall, abstract, goal on top (cf. HAEDRICH et al., 1986, 122). Outgoing from that you can identify spheres of activity which contribute to reach your goal, further the definition of concrete measures gets easier and comes closer (cf. HAEDRICH et al., 1986, 122). If possible, break down this intermediate level into hard and controllable facts and you come to the level where all actions are written down and can be controlled, checked and evaluated immediately (cf. HAEDRICH et al., 1986, 122).

This process of just rating items and afterwards the decision will be clear sounds very easy, but as research shows, the prediction validity is very high (cf. HUIZINGH

and VROLIJK, 1997, 37). To add a further result, the AHP can be applied and repeated several times to the same decision problem in order to rank alternate solutions to the case (cf. HUIZINGH and VROLIJK, 1997, 37).
EISENFÜHR and WEBER demand following points to draw good decisions (cf. EISENFÜHR and WEBER, 1999, pp. 6):

- Alternatives that cannot be realized or consequences that are not to happen should be left out of the process.
- If there are reliable predictions on the future and circumstances concerning your decision, they should have to get into the model.
- The assumption of transitivity is true (e.g.: "If A is better than B, B is better than C – then A will always be better than C") as well as the preference is not a matter how the alternatives are visualized or even existing.
- Try to bring your decision, predictions on the future altogether in a model in order to find restrictions as well as stimulate your creativity to the problem.

At the end you come up with several alternatives, let us call this bulk A containing the single alternative a (cf. EISENFÜHR and WEBER, 1999, 18). A bearing at least two elements being bared from each other (cf. EISENFÜHR and WEBER, 1999, 18). An alternative which bears more than one step is called "strategy" (cf. EISENFÜHR and WEBER, 1999, 19). The decision maker has to assure of his aims, the strategies he has and the consequences of his action (cf. EISENFÜHR and WEBER, 1999, 31). Preferring one of the alternatives is tried to be visualized by formulating this preference with a mathematical function (cf. EISENFÜHR and WEBER, 1999, 33). For good visualizing the problem, the tree-structure is held to be a well-suited measure (cf. EISENFÜHR and WEBER, 1999, 38).

4.3 Rating Process

If there are exposed two configurations of a certain item of a product to the proband during the research process it is called "fractionating" and represents a method of quantitative rating (cf. GREEN and TULL, 1982, 165). The test person has to make a tradeoff which form of an item results in a higher satisfaction for him and connect a mathematical value with a verbal expression, e.g. "A is 3 times better than B", "C is just as half as good as D" (cf. GREEN and TULL, 1982, 165). The task is to develop a

useful scale which depicts how someone sees two alternatives and how they influence each other (cf. SAATY, 1996, 6). For the rating scale this implements having different levels from which the respondent can choose the best fitting one (cf. SAATY, 1996, 8). SAATY realized that problems have to be both: structured and broken down into small compartments in order to get comparisons that are manageable for any respondent (cf. SAATY, 1996, 8). The better a problem becomes analyzed and broken down, the better the results get and for the AHP this meant: Identifying the overall goal, considering all possible influences and reduce them to the single element (cf. SAATY, 1996, pp. 11).

The number of comparisons that have to be made, is as high as perhaps supposed - they can be computed by following mathematical equation at given n alternatives to evaluate (cf. WEBER, 1993, 51):

$$\frac{n\,(n\,-\,1)}{2}$$

Ranking Scale Processing the AHP means as explained ranking two presented items with the use of a certain scale. For the following explanation we use character "A" and "B" for the two possible forms of our element (cf. SAATY, 1996, 18). Two elements compared to each other is called making paired comparisons (cf. SAATY, 1996, 6). The formal expressions are shown following (SAATY, 1996, 18).

Table 3: AHP Scales: Formal expressions of the numbers

Expression	Corresponding value
"A" and "B" are equally important	1
"A" is weakly more important than "B"	3
"A" is strongly more important than "B"	5
"A" is demonstrably or very strongly more important than "B"	7
"A" is absolutely more important than "B"	9

The numbers 2, 4, 6, 8 are left out of Table 3 - they are used for marking intermediates between the two encircling levels (cf. SAATY, 1996, 18). There was a lot of discussion in science about how many levels a scale should bear and this started long before SAATY published his theory concerning the AHP, as the work of MILLER shows. The research on scales used varied in a huge range: from seven items up to 150 levels were used (cf. MILLER, 1955, s.p.). Even when scales are used offering more levels, there seems to be a limit in humans' brain capacity at about ten levels (cf. MILLER,

1955, s.p.).
According to DYER and FORMAN paired comparisons are suitable to estimate importance (cf. DYER and FORMAN, 1991, 136). Further, preferring one solution to another one is no problem at all as well as estimating the relative likelihood, when you do not know if an alternative is likely to happen (cf. DYER and FORMAN, 1991, 136).
SAATY ran his AHP in order to test its stability, reliability and made experiments with smaller and larger scales (cf. SAATY and OZDEMIR, 2003, 359). He identified a span from seven till nine elements among humans are capable to weigh properly the alternatives, larger numbers have negative effects on the results (cf. SAATY and OZDEMIR, 2003, 244).

Getting the weights The items which are compared get exactly determined by the different indices i, j with i, j = 1, 2, ..., n. Each alternative A becomes identified as a_{ij} (cf. SAATY, 1996, 22).

Let be a_{ij} the ranking of item a, regarding the feature i with level j – if we have a look at the matrix arrangement there are not as much comparisons needed as thought from beginning, because the ranking of a_{ij} can be computed from the foregoing: it is just the reciprocal $\frac{1}{a_{ij}}$ or easier a_{ji} (cf. SAATY, 1996, 18). So we come to the two rules, SAATY demands:
Rule 1: If $a_{ij} = \alpha$ then $a_{ji} = \frac{1}{\alpha}$ with $a_{ji} \neq 0$
Rule 2: If $a_{ij} = 1$ then $a_{ji} = 1$

The matrix P writes as:

$$P = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix}$$

Including the reciprocals and the values when items are compared with itself, the matrix changes to (cf. SAATY, 1996, 19):

$$P = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ 1/a_{12} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/a_{1n} & 1/a_{2n} & \dots & 1 \end{bmatrix}$$

The next step is to compute the sums of each column c_i and dividing each element

of a column by its computed sum (cf. MEIXNER and HAAS, 2010, pp. 209). This step is called normalization of the columns and after this transformation each column's sum shows the value "1" (cf. MEIXNER and HAAS, 2010, pp. 209):

$$c_i = \sum_{j=1}^{n} a_{ij}$$

The matrix looks as following:

$$P = \begin{bmatrix} a_{11}/c_1 & a_{12}/c_2 & \dots & a_{1n}/c_n \\ a_{21}/c_1 & a_{22}/c_2 & \dots & a_{2n}/c_n \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1}/c_1 & a_{n2}/c_2 & \dots & a_{nn}/c_n \end{bmatrix}$$

Ongoing, the rows have to be transformed as following:

For row "1": $r_1 : w_1 = \frac{r_1}{n}$ with $r_{1j} = \sum_{j=1}^{n} r_{1j}$

For row "2": $r_2 : w_2 = \frac{r_2}{n}$ with $r_{2j} = \sum_{j=1}^{n} r_{2j}$

$\vdots$

For row "n": $r_n : w_n = \frac{r_n}{n}$ with $r_{nj} = \sum_{j=1}^{n} r_{nj}$

Summarizing all the computed values:

$$w_i = \sum_{i=1}^{n} w_i = 1$$

The eigenvector $\vec{w}$ can be written as:

$$\sum_{i=1}^{n} r_i = 1 = \vec{w} = \begin{pmatrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{pmatrix}$$

Making paired comparisons during processing the AHP makes it necessary to check if the decisions were done in a consistent way (cf. MEIXNER and HAAS, 2010,

pp. 237). Consistency is a theoretical construct, making transparent if a single person has made its comparisons in a contradictory way or not within their paired comparisons EISENFÜHR and WEBER (1999, pp. 129).
TSCHEULIN suggests those index for consistency as good indicator of the AHP's quality (cf. TSCHEULIN, 1991, pp. 1275).

In order to compute the consistency index we need the sum of all the elements in the main diagonal from our last matrix above that is computed as follows (cf. MEIXNER and HAAS, 2010, 240):

$$\lambda_i = \frac{\overline{r_i}}{w_i} \cdot a_{ii} \qquad \text{with} \qquad i = 1, 2, ..., n$$

$$\lambda = \sum_{i=1}^{n} \lambda_i$$

$$\lambda_{max} = \frac{\sum_{i=1}^{n} \lambda_i}{n}$$

The value for λ_{max} is the missing item to be able to compute the consistency index (cf. SAATY, 1996, 21). Ongoing the formula for the consistency ratio follows:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

$$CR = \frac{CI}{R}$$

For an interpretation of this index you have to consider the number of comparisons which have to be made during the process (cf. MEIXNER and HAAS, 2010, 241). The more items to compare, the harder it is to remember all items and weights you have already given as respondent according your goal (cf. MEIXNER and HAAS, 2010, 241). The consistency ratio level rises with the number of items that get compared to each other (cf. MEIXNER and HAAS, 2010, 241). For different sized matrices there are values with which you can compare the values with your own results (cf. MEIXNER and HAAS, 2010, 242). The level of R computed for a research has to be lower than that mentioned in Table 4. As MEIXNER and HAAS co-operate in research with SAATY Table 4 is adopted from their work (cf. MEIXNER and HAAS, 2010, 242):

Processing Quantitative Data Until now, we just processed the AHP with data from the paired comparisons. The integration of quantitative data, e.g.: pricing information,

Table 4: Levels for R at given size of the matrix

Matrix with size n	1	2	3	4	5	6	7	8	9	10
Value of R	0.00	0.00	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49

is presented in accordance to MEIXNER and HAAS. For example testing concepts for sportive cars, the criteria "Power" will be regarded as "the more, the better"; so the computed values have to reflect an increase with the values (cf. MEIXNER and HAAS, 2010, 228). The formula for this case reads as:

$$w_i = \frac{a_i}{a_1 + a_2 + \ldots + a_n} \qquad i = 1, 2, ..., n$$

When we change in our example the sportive car into a small one which should not need a lot of fuel, the formula has to be adjusted with reciprocals as following in order to reflect the right intentions (cf. MEIXNER and HAAS, 2010, 228):

$$w_i = \frac{{a_i}^{-1}}{a_1^{-1} + a_2^{-1} + \ldots + a_n^{-1}} \qquad i = 1, 2, ..., n$$

4.4 Applications of the AHP

The economic downturn, which started in late 2008, was an opportunity to use the AHP for predicting the resurgence of the US economy (cf. BLAIR et al., 2010, 114). Unfortunately the prediction did not fulfil as there were effects that made it more difficult for the economy, but as the AHP is adjustable they did it again with the result, that it will take a bit more time for the US economy to reach its old strength (cf. BLAIR et al., 2010, 121).

HO (2008) found that the AHP is topic of numerous scientific articles and according to the review of scientific journals it seems that their number is increasing what seem to root in its grown importance (cf. HO, 2008, 225).
SAATY and VARGAS applied the AHP methodology to political cases, too: the christian arguments in Northern Island, scenarios of the Cold War, the conflict area in the Middle East as well as trade negotiations between two countries cf. SAATY and VARGAS (1991, pp. 29). The good usability as well as its open structure for new inputs, makes the AHP a valuable tool for great applicability, e.g.: Logistics and production planning were the fields, most applications were done (cf. BLAIR et al., 2010, 226). The flexibil-

ity allows to apply the AHP to various fields as e.g.: mathematics, strategic decisions, NPD and data analysis (cf. BLAIR et al., 2010, 226).

SAATY and VARGAS show that one of the strengths of the AHP is the capability of combining several techniques in prediction and planning instead of just using one single approach (cf. SAATY and VARGAS, 1991, pp. 7). The AHP is able to combine "delphi techniques, data from market research, expert's panel consensus as well as visionary forecast" (SAATY and VARGAS, 1991, pp. 7).

The widely used AHP was introduced as tool for decision support and brings good results as well in fields like engineering or the social sector (cf. VAIDYA and KUMAR, 2006, 18). Here the tasks are the selection within concepts or decisions about strategies and human resources (cf. VAIDYA and KUMAR, 2006, 18). So any decision maker could ask himself if his actual problem fits into one of those categories and then consider the application of the AHP (VAIDYA and KUMAR, 2006, cf. 18). The authors describe the AHP as a tool which integrates both: flexibility by means of structure as well as being open for multiple variables and criteria which problems may bear (cf. VAIDYA and KUMAR, 2006, 18). Due to adjustable rating scales, for example the flexibility of the rating scale can be incremented as they found five-level scales and even one with 100 steps (cf. VAIDYA and KUMAR, 2006, 18).

Software in teaching, support and applicating the method seems to be helpful as BODIN and GASS (2003, 1488) and OSSADNIK and LANGE (1999, 587) suggest. Therefore the software package EC has been tested in numerous cases and delivered good results. An advantage of the software package is that inconsistent comparisons can be identified, rethought and better values inserted during the inquiry (cf. BODIN and GASS, 2003, 1491)

4.5 Critical statements

Scientists have argued a lot about the AHP's scale and the numerical ratings (cf. DYER and FORMAN, 1991, 120). To back up the AHP is really a good tool for drawing decisions, he should get applied to problems being already solved (cf. DYER and FORMAN, 1991, pp. 122). Doing the comparison with numbers is no problem at all, because they are connected with a description how the level can be interpreted so it works with numbers and descriptions (cf. DYER and FORMAN, 1991, 123). As we have seen, the AHP

allows to structure und simplify a problem. The most important thing is to say which alternative you would prefer among different opportunities than having every information available (cf. BAMBERG and COENENBERG, 1996, 17). DYER and FORMAN (1991) adds that the construct of consistency is important, but sufficiency does not proof that a decision is good - the reasons why inconsistent ratings should be regarded (cf. DYER and FORMAN, 1991, 180).

CALANTONE et al. (1999) emphasize the importance and power of a tool like the AHP, to deal with complexity and numerous information to be considered. New products got so many points which cannot left out and managers tend to simplify the problem too much, so that essential input does not get into the pool of information from which the decision is drawn (cf. CALANTONE et al., 1999, 74). Instead of drawing decisions at first glance, a considerate strategy seems to be more appropriate facing unstable information (cf. CALANTONE et al., 1999, 74). No matter if new product screening or management decisions are due the AHP provides enough power for each, whether the decision-maker is employed in management or research (cf. CALANTONE et al., 1999, 74).

TOMLINSON (1981) points out that well-thought considerable decisions require thinking about both: consequences of actions as well as those of strategies you did not take (cf. TOMLINSON, 1981, 204). The analyst's task is to define the model as keep it running up to date during the changing circumstances and perhaps necessary adjustments through the execution of a decision (cf. TOMLINSON, 1981, pp. 206). Nonetheless models are telling the management how easy solutions get through the research process, a complex system will always remain complex (cf. TOMLINSON, 1981, 208). He ends with a remarkable sentence which says that analyzing a problem and thinking about solutions has to run according scientific principles, which totally differs from just applying a scientific process (cf. TOMLINSON, 1981, 212).

ROMMELFANGER and EICKEMEIER (2002) add that the AHP's paired comparisons are not so easy to make in real situations, as probands are not always capable of formulating them with the required exactness (cf. ROMMELFANGER and EICKEMEIER, 2002, 163). Additionally, the relationship and importance of two items is usually know just in a vague way (cf. ROMMELFANGER and EICKEMEIER, 2002, 163).

4.6 AHP - future

Developing countries need flexible and powerful tools to manage their transformation to the (post-)industrial world at "lightning speed" and the AHP could give them the power for good decisions they barely need (cf. VAIDYA and KUMAR, 2006, 20). In their situation, numerous groups and interests have to be considered for making decisions that bring the land in a good position for bargaining with the rest of the world (cf. VAIDYA and KUMAR, 2006, 20). The conclusion of VAIDYA and KUMAR (2006) sees four points of interest concerning the AHP (cf. VAIDYA and KUMAR, 2006, 21):

- AHP can be applied in a huge range of problems.
- AHP is a tool for developing countries to make good decisions without the surrounding structures of industrialized countries.
- Continuing research will improve the applicability of the AHP so that it can be connected with other research tools, methods and interdisciplinary knowledge.
- As the tool gets more powerful, the complexity of the cases to be solved can rise or more aspects get integrated in the decision making process.

Further the AHP is seen as a suitable tool even for group decisions, too (cf. GOLDEN, 1989, 21). No matter if one group cannot get to one solution it gets divided and by calculating the geometric mean the result of the group can be expressed (cf. GOLDEN, 1989, 21).

Summary

The AHP's development from a tool to solve decision problems into a research method in marketing activities was shown in the chapter. The mathematical basics were the basis to explain the method and its function. Parameters ensuring the quality of a research and results from other studies applying the AHP were presented. Critical amendments to the method were mentioned in the end.

5 Discrete Choice

In this chapter the development and theoretical basis for Discrete Choice experiments are shown.[4] At first there is a spot on the method's development, then the mathematical basics are explained. Afterwards the parameters indicating a good fit of the model get explained.

The theoretical basis for choice applications are rooted back in the 1960s to LUCE and TUKEY (1964). Methods using the conjoint attempt are trying to identify what feature of the product contributes in which amount to the overall perceived value and lead to a purchase (cf. BACKHAUS et al., 1994, 499). The products or concepts of them get rated, ranked or chosen and the part–worths of the single compartments are computed (cf. BACKHAUS et al., 1994, 499). As a synonym "decompositional method" stands for this type of research attempt (cf. BACKHAUS et al., 1994, 499). According to HUBER the word "conjoint" is not a combination of "CONsider JOINTly" but "become joined together" (cf. HUBER, 2005, 1).

THEUERKAUF shows the method's potential to be used in any field of activity in an enterprise: innovations, purchase of production factors, production itself, the marketing department and service (cf. THEUERKAUF, 1989, 1187). Further, choice experiments can be applicated on pricing, idea generation and evaluation of new product concepts (cf. HARTMANN and SATTLER, 2002, 11). Pricing, market segmentation and competitive analysis are further fields for application (cf. MELLES and HOLLING, 1998, 6). Even influence on a company's corporate culture seems to happen (WITTINK et al., 1992, s.p.).

MELLES and HOLLING focused on research activities among german enterprises during the mid 1990s (cf. MELLES and HOLLING, 1998, 3). The number of applications he found in his study ordered according field of research, are shown in table 5 (cf. MELLES and HOLLING, 1998, 5):

In a 2005 published survey of SAWTOOTH SOFTWARE between 5,000 and 8,000 conjoint experiments were assumed to be done in a twelve month period with the help of their software (cf. HUBER, 2005, 1).

The method bears a lot of potential which goes hand in hand with increased flexibility of personal computers which are used for doing those studies: present images, record choices, adaptation of choice according to customers' desires (cf. HUBER, 2005, pp. 11). Experiments are no longer done under laboratory conditions but with

[4] Synonymously for Discrete Choice (DC), the term Choice Based Conjoint (CBC) is used.

Table 5: Conjoint Applications

Field of research	No. of experiments
Consumer goods	62
Industrial goods	40
Financial service	23

an increased reality and the price of the studies is seen on the decline (cf. HUBER, 2005, pp. 11)

In order to ensure to provide unbiased and reliable information, the following list of criteria should be considered when designing a choice process (cf. BACKHAUS et al., 1994, pp. 500):

1. Non-relevant features of the product should be left out in order to simplify the research.
2. Criteria which cannot be influenced due to production or technical restrictions or infeasible ones should be left out.
3. The characteristics themselves have to be independent from each other.
4. If one category gets reduced and at the same time another rises, one can compensate the other.
5. Do not integrate knock-out criteria.
6. Restrict the number of product stimuli as probands' capacity is limited.

THEUERKAUF points on the variability of the choice process: Both, quantitative and qualitative data can be recorded if you manage a limited number of attributes (cf. THEUERKAUF, 1989, 1180).
WITTINK et al. (1992) concluded that the presentation of products whether written on cards or displayed on a screen is a useful help for respondents to draw decisions upon them (cf. WITTINK et al., 1992, s.p.).
Companies spending money for R&D are interested in as much information as possible for the investment (cf. BACKHAUS et al., 1994, 508). Increasing the number of attributes results in a quick growth of alternatives and you should reduce them to insure valid results (cf. GREEN and SRINIVASAN, 1990, 16). For reduced designs the work of ADDELMAN (1962) can be consulted or the procedure ORTHOPLAN carried out

which is included in the SPSS/PASW software package (cf. BACKHAUS et al., 1994, pp. 545). In classic conjoint experiments the proband has to order a set of cards according to his preference (cf. BACKHAUS et al., 1994, 510). The problem could be an annoying procedure and as reaction unconsidered decisions which are hard to interpret (cf. BACKHAUS et al., 1994, 510).
Attempts to improve came for example from THEUERKAUF (1989) who suggested to let probands do trade-offs between just two cards what is not so hard to do (cf. THEUERKAUF, 1989, pp. 1180). VRIENS et al. (1998) identified two stages during the NPD process where choice experiments can be applied:

- Finding all possible items or attributes that might result in one new product by idea screening (cf. VRIENS et al., 1998, 466).
- Combine them to realizable products, reduce the amount of abstraction and integrate the customer's desires for shape, aesthetic wants, colors and design (cf. VRIENS et al., 1998, 466).

A picture's advantage is its huge amount of information transported, especially aesthetic aspects that technical explanation is not capable of due to complexity (cf. COOPER, 2004, 458). GREEN and TULL agree, and state that the research situations become more realistic (cf. GREEN and TULL, 1982, 458). Technical as well as scientific findings helped to develop the conjoint methods (cf. GREEN and SRINIVASAN, 1990, 16). The two main aspects are seen in the availability of portable, computer aided solutions and varieties of conjoint analysis that are both: flexible and stable (cf. GREEN and SRINIVASAN, 1990, 16). Hence other new approaches are developed, new technical tools like microcomputers can reduce mistakes and improve results (cf. GREEN and SRINIVASAN, 1990, 16). According to GREEN and SRINIVASAN (1990) there should be research which type of choice experiment fits best to the research situation (cf. GREEN and SRINIVASAN, 1990, 15). Data processing and aggregation as well as the range of items that can be integrated are fields for further research (cf. GREEN and SRINIVASAN, 1990, 15). Hence CM is getting more and more user friendly the studies they are hard to compare, due to unpublished details (cf. MELLES and HOLLING, 1998, 17).

HARTMANN and SATTLER identify the factors affecting the quality of a choice experiment (cf. HARTMANN and SATTLER, 2002, 12): Good instructed interviewers are able to get respondents and involve them to the topic which has to be well prepared and connected to all tangibles. Further research could focus on influences of factors, e.g.:

age or education on the results in a positive or negative way (cf. SATTLER et al., 2003, 18).

5.1 Discrete Choice approach: Choice Based Conjoint

One of the recent developments, CM made is called "Discrete Choice", which gained popularity among researchers in the 1990s (cf. BALDERJAHN et al., 2009, 129). CBC-methods have emerged from the work of LOUVIERE/WOODWORTH in 1983. The name of the method implies a choice task proceeded, instead of ranking (cf. KLEIN, 2002, 37), and science differentiates between binary (choice among two alternatives) and multinomial (choice among more than two alternatives) models (cf. MAIER and WEISS, 1990, 131). CBC is applied in a huge range of fields: Choice on transport medium, willingness-to-pay, product features, NPD, tourism, eco-labelling, financial services and e-commerce (cf. BALDERJAHN et al., 2009, 137).

As the complete task of rating is replaced with a choice, this type of conjoint has an exceptional position (cf. BALDERJAHN et al., 2009, 129). The proband gets confronted with several sets of products within he is able to choose one or none at all (cf. MAIER and WEISS, 1990, 130). Referring to BEN-AKIVA and BOCCARA, the proband's choice is the alternative which fits most into his preferences (cf. BEN-AKIVA and BOCCARA, 1995, 22). Additionally, the designer of the research can have a selective influence on the products which are in the choice range, e.g.: blocking certain combinations of attributes (cf. BEN-AKIVA and BOCCARA, 1995, pp. 22). This influence could be useful when there are a lot of alternatives to rate: Overwhelming situations for interviewees can be avoided by reducing the number of choice tasks (cf. BALDERJAHN et al., 2009, 134). Unfortunately, this choice just tells us something about preference of one alternative over the others, consequently some parameters remain blurred (cf. BALDERJAHN et al., 2009, 134).

The research of HUBER backs up the importance, CBC has gained with numbers (cf. HUBER, 2005, 1). In 2003, between 5,000 and 8,000 conjoint studies got approximately carried out, with a ranking between different types of CM as following in table 6 (cf. HUBER, 2005, 1).

The choice between a set of alternatives implicates more than two options to choose within (cf. MAIER and WEISS, 1990, pp. 135). This can handle the probability of the ex-

Table 6: CM: Varieties and shares

Type	[%]
Choice Based Conjoint	62
Adaptive Conjoint	27
Traditional Conjoint	12

istence of other options of choice by its IIA–feature (cf. MAIER and WEISS, 1990, 141). The model tells, that a decision within for example two alternatives, is not influenced by the existence, criteria or availability of a third one (cf. MAIER and WEISS, 1990, 141).

For the research in this thesis we examine probands' choice among three alternatives. MAIER and WEISS (1990) explain that choosing a product is induced by a combination of two compartments of benefit: The deterministic part and the random or stochastic part (cf. MAIER and WEISS, 1990, pp. 129). The stochastic part, represented by parameter ϵ remains unexplained by socio-economic variables (cf. MAIER and WEISS, 1990, pp. 129). The other part of benefit then is explained by those socio-economic variables (cf. MAIER and WEISS, 1990, 130). The author supposes to use the LOGIT-model, as probands choose within sets with more than just two alternatives (cf. MAIER and WEISS, 1990, 131).

5.2 Mathematical model

Unfortunately DC with just one chosen item bears less information than the traditional CM with its ranking of all products (cf. KLEIN, 2002, 37). For the interpretation KLEIN suggests to use the LOGIT-distribution (cf. KLEIN, 2002, 37). The model uses a distribution called GUMBEL, this source also provides further theoretical information for DC experiments (cf. TRAIN, 2009, 34). The LOGIT-model, leading among DC experiments by numbers in application, can be written as (cf. MAIER and WEISS, 1990, 135) and (cf. TRAIN, 2009, 18):

$$P_{in} = \frac{e^{\mu V_{in}}}{\sum_{j \in A_n} e^{\mu V_{jn}}}$$

This equation bears the most important and relevant points of the model as explained following (cf. MAIER and WEISS, 1990, pp. 138):

- Choice probabilities are situated in between the interval $[0 \dots 1]$; The division of

two positive numbers is always bigger than zero and as the numerator is as well part of the denominator, the fraction's value is in between the interval $[0 \dots 1]$.

- The sum of all probabilities in the choice is "1".
- The probability of choosing one alternative reaches the extreme parameters "0" or "1" only in extreme circumstances: If the deterministic part of a choice reaches +/- ∞, the stochastic part whether is "0" or "1".
- The probability of choosing an alternative rises with the value of its deterministic utility compartment.
- The parameter μ is valued "1" (cf. MAIER and WEISS, 1990, 144). Otherwise, μ getting very small, will make disappear the deterministic part and the choice is nothing but random.
- The "IIA" criteria[5]: "The ratio in probability of choice in between two alternatives is independent from availability and existence of other alternatives" (MAIER and WEISS, 1990, 141).

MAIER and WEISS (1990) mention that there always remain features blurred for the researcher, he never knows about all his socio-economic parameters which he cannot measure exactly, as a consequence, and the way of their influence (directly or indirectly) remains undiscovered (cf. MAIER and WEISS, 1990, pp. 98). Following equation describes their theory (MAIER and WEISS, 1990, 100):

$$\tilde{U}_{in} = V(C^*_{in}, S^*_n) + \tilde{\epsilon}_{in}$$

with:

- $\tilde{U}_{in}$ is the part of utility told by both, observable variables and the part that cannot be explained by the model $\tilde{\epsilon}_{in}$.
- V represents the function that is observable and bears characteristics of both, alternatives and socio-economics, the deterministic part.
- C^*_{in} and S^*_n are the characteristics of the alternatives and socio-economics.
- $\tilde{\epsilon}_{in}$ as the random factor. This random factor can be interpreted as an indicator to specify to use a certain distribution for utility calculation (cf. BALDERJAHN et al., 2009, 131).

[5] "Independence from Irrelevant Alternatives"

The different parts are explained in detail as for example in BALDERJAHN et al. (2009). The deterministic part, $V(C_{in}^*, S_n^*)$ written as an additive model reads (cf. BALDERJAHN et al., 2009, 130):

$$v_{ik} = \sum_{p=1}^{P} \sum_{m=1}^{M_p} v_{ikmp} = \sum_{p=1}^{P} \sum_{m=1}^{M_p} \beta_{ikmp}\, x_{imp} = \beta'_{ik} x_i$$

with

v_{ikmp} utility of value m here in feature p of product i for consumer $k \in K$

x_{imp} as type and status of feature m at p of product i

β_{ikmp} the parameter of utility of feature m at p of product i for consumer $k \in K$

This deterministic compartment more precisely shows the influence of parameters on the buying decision (cf. BALDERJAHN et al., 2009, 131). One part of it is called generic part and gets rated of the customer without comparing it to the alternatives but to his own feelings (cf. BALDERJAHN et al., 2009, 131). The product specific variable, by contrast, depends on the availability of alternatives and their number that it influences, too (cf. BALDERJAHN et al., 2009, 131). The third group, nominal features, gets described by so called "Dummy-variables" (cf. BALDERJAHN et al., 2009, 131). If a feature, or e.g.: a label, is available, the variable is valued with "1", instead "0" (cf. BALDERJAHN et al., 2009, 131). The probability of choosing a specified item, when using the LOGIT-model, can be written as (BALDERJAHN et al., 2009, 131):

$$P_{ik} = \frac{exp\,(v_{ik})}{\sum_{j=1}^{I} exp\,(v_{jk})} = \frac{exp\left(\sum_{p=1}^{P} \sum_{m=1}^{M_p} \beta_{ikmp}\, x_{imp}\right)}{\sum_{j=1}^{I} exp\left(\sum_{p=1}^{P} \sum_{m=1}^{M_p} \beta'_{jk} x_j\right)} = \frac{exp\,(\beta'_{ik} x_i)}{\sum_{j=1}^{I} exp\,(\beta'_{jk} x_j)}$$

The parameters of β_{ikmp} have to be estimated and P_{ik} can be calculated ongoing (cf. BALDERJAHN et al., 2009, 132).

5.3 Interpretation

As the linear influences on vector β_{ik} result in the deterministic value, we have to focus on the non-existent linear influence of the product's characteristics on the probability of choice P_{ik} (cf. BALDERJAHN et al., 2009, 132). Concerning the algebraic sign of β a positive algebraic sign increases the probability of choice, vice versa when having a negative one (cf. BALDERJAHN et al., 2009, 132). Further this parameter is influenced in computation by its category: linear or categorical (cf. BALDERJAHN et al., 2009, 132). The last case demands for more parameter estimation, per product characteristic there

are needed $M_p - 1$ parameters (cf. BALDERJAHN et al., 2009, 132). As one of the levels of the parameter is always zero, the estimated probability of choice rises or declines by a discrete value (cf. BALDERJAHN et al., 2009, 132).
We know x_{imp} influences the choice P_{ik}, but we know nothing about its strength; BALDERJAHN et al. suggest using the ratio between the probability and its counter probability which is called *Odd* (cf. BALDERJAHN et al., 2009, pp. 132):

$$Odd = \frac{P_{ik}}{1 - P_{ik}}$$

So if an Odd occurs with the value "5", something is five times more important to the customer (cf. BALDERJAHN et al., 2009, 133). Comparing two Odds leads to the *Odd ratios* telling the amount of influence of one parameter on the other has (cf. BALDERJAHN et al., 2009, 133):

$$Odd\,ratio = \frac{odd_{i(m+1)p}}{odd_{imp}} = e^{\beta_{ikmp}}$$

The odd ratios influence the probabilities of an incidence in this case: choice or not (cf. BALDERJAHN et al., 2009, 133). An increase in Odd ratio from 1 to 2 means – for describing the probability of choice – that ratio 2:1 rises to ratio 4:1 (cf. BALDERJAHN et al., 2009, 133). Odds processed with the log–function are called *Logits* that are able to be interpreted as dependent variables as in a regression (cf. BALDERJAHN et al., 2009, 133).

Data analysis - Methods and statistical processing Regarding our sample consisting of BOKU-students, we must admit that besides students were chosen randomly, the choice of the students means a stratification with respect to Austria's population. A sample from the population can be influenced whether by the explaining variables or the results from the choice tasks of the individuals (cf. MAIER and WEISS, 1990, 210). For both cases the approximation with the LOGIT-model and the used estimators ends up in stable results, for it was chosen (cf. MAIER and WEISS, 1990, pp. 211).

According to MAIER and WEISS (1990) the variables used for constructing the choice sets can be grouped as:

1. Alternative specific constants are closely related to the relative frequency of the alternatives (cf. MAIER and WEISS, 1990, pp. 178).

2. Generic variables tell about coefficients' significance on the model (cf. MAIER

and WEISS, 1990, pp. 182).

3. Socio-economic variables can be interpreted only in connection with the others (cf. MAIER and WEISS, 1990, pp. 186).

5.4 Binary logistic regression

In this research, the dependent variable – purchase or non-purchase of the product, can be interpreted as binary variable (cf. BACKHAUS et al., 2011, 244). The logistic regression tries to identify the variables influencing the binary case of purchase and non-purchase (cf. BACKHAUS et al., 2011, 244). The Probability P of purchase is noted in mathematical way as following (cf. BACKHAUS et al., 2011, 244):

$$P(y = 0) + P(y = 1) = 1$$

$$P(y = 0) = 1 - P(y = 1)$$

These equations need to be connected with a function linking the information from independent variables with the results 1 or 0 (cf. BACKHAUS et al., 2011, 249). Those independent variables are called "covariants" and can be both, metric as well as non-metric (cf. BACKHAUS et al., 2011, 252).

The probabilities of choosing an item can be processed with the logistic function and graphically expressed by drawing it in a co-ordinate system (BACKHAUS et al., 2011, 249). The shape has to be like an "s" instead of a straight line in a linear model (cf. BACKHAUS et al., 2011, 249). If an "s" shape can be observed, the independent variables really have a non-linear connection (cf. BACKHAUS et al., 2011, 250).:

$$p = \frac{e^{logit}}{1 + e^{logit}}$$

On the y-axis the two levels: purchase (="1") or non-purchase (="0") are found. The x-axis' values have to be computed from the "logits", received by activating this option during the logistic regression procedure in SPSS. Plotting the values leads to the above described curve. Although we have a sample of 50 respondents, the DC analysis can just be run at individual level (cf. TRAIN, 2009, 29). The individual gets chosen in accordance to the compared age group out of the AHP.

5.5 Statistical parameters

The LogLikelihood-Function, (LL-Function) reflects the fit of the parameters and the improvement of the model when entering more variables (cf. BACKHAUS et al., 2011, 261). Good models' value for -2*LL decreases then and significance rises up (cf. BACKHAUS et al., 2011, 270). According to BACKHAUS et al. the value -2*LL is compared with the χ^2 table at the required levels [6]. This value is analyzing the "deviance" and we can test following hypothesis (cf. BACKHAUS et al., 2011, 261):

H_0 : "Perfect fit of the model"

H_1 : "No perfect fit of the model"

Likelihood-Ratio subtracts the maximum of LogLikelihood (low value) from the value when all the independent variables are set to zero (higher value) (cf. BACKHAUS et al., 2011, 262). The number in degrees of freedom is the number of independent variables entering the model (cf. BACKHAUS et al., 2011, 262). $|LL_0 - LL_1|$ This difference is compared with the χ^2 value at the number of variables entering the model (cf. BACKHAUS et al., 2011, 263). Rejecting null hypothesis means, your variables have power to contribute to the result (cf. BACKHAUS et al., 2011, pp. 262):

H_0 : "Each coefficient is zero"

H_1 : "Coefficients are not zero"

The table with the **classifications** can be taken in focus if the model predicts the categories better than a random classification of the objects (cf. BACKHAUS et al., 2011, pp. 265). The probability should be higher than that which is at random classification (cf. BACKHAUS et al., 2011, 270). In our research, probands choose one out of three alternatives, the probability for "purchase" is $1/3$ and "no purchase" $2/3$.

Press's Q test analyses the classification with following equation (cf. BACKHAUS et al.,

[6] χ^2 at (K-J-1) degrees of freedom; with K = no. of observations and J = number of parameters

2011, 268):

$$Press's\,Q = \frac{[K - (K \cdot G \cdot a)]^2}{K\,(G - 1)}$$

K = no. of observations
G = no. of groups and
a = no. of elements classified correctly
The Press's Q should exceed the value of χ^2 to have a classification differing significantly from a random classification (cf. BACKHAUS et al., 2011, 268).

Hosmer-Lemeshow examines the correctly predicted groups χ^2 value needs to be as low as possible and significance above 70 % (cf. BACKHAUS et al., 2011, 276). Classification tests are useful to check if the the model is better than a random ordering of the elements without knowledge of the variables and independent parameters (cf. BACKHAUS et al., 2011, pp. 276).

McFadden-R^2 is a test for the model with acceptable values above 0.2 – a good model fit is indicated above 0.4 (cf. BACKHAUS et al., 2011, 270).

Cox and Snell-R^2 compares the likelihood values – the levels are as above: acceptable from 0.2 or better and good fit from 0.4 or better (cf. BACKHAUS et al., 2011, 270).

Nagelkerke-R^2 explains the variation of the dependent variable by the independent ones and has by contrast to the Cox and Snell-R^2 more predictive capacity and should be in the focus (cf. BACKHAUS et al., 2011, pp. 264). Interpretation levels are as above, 0.2 – acceptable, 0.4 – good; 0.5 and above – very good fit of the model (cf. BACKHAUS et al., 2011, 270).

Summary

Discrete Choice, the second method applied in this research got presented with its basis as well as extensions that are needed to do the research, compute the statistics and interpretation of the results. Discrete Choice as being a development from Conjoint Measurement got a powerful tool which shows the consequent evolution of a method in marketing over time.

6 Comparisons: AHP versus Choice Experiments

This chapter focuses on the comparison of the two methods applied to this research. Furthermore the process of sampling

Quality of Test Criteria LIENERT (1967, 12) supposes following criteria to ensure the quality of a statistical test: three main criteria and four subcriteria:

- Main criteria: Objectivity, reliability and validity.
- Subcriteria: Standardization of you research design, comparability of your results to those from other studies, the economic dimension of the research and the usefulness of the results.

Objectivity means that the result is not influenced by the searcher: The researchers behavior, the tests' evaluation and the interpretation of the results ((cf. LIENERT, 1967, pp. 13) or (cf. BORTZ and DÖRING, 2006, 195)). Too many degrees of freedom in the questionary might decrease the quality of the research (cf. BEREKOVEN et al., 2004, 88).

Reliability corresponds to the amount of exactness in measuring an attribute (cf. LIENERT, 1967, pp. 14)(cf. BORTZ and DÖRING, 2006, 196). This exactness can be verified by retesting your sample or a split of the results, separate analysis each and comparison (cf. BEREKOVEN et al., 2004, 89).

Validity explains the exactness of your research method (cf. LIENERT, 1967, pp. 16). BEREKOVEN et al. sums up the three criteria in one sentence: Without objectivity there is no reliability which is never obsolete for a valid instrument to take measures (cf. BEREKOVEN et al., 2004, 91). Consequently, researchers use standardized questions or standardized conditions in order to minimize external influence (cf. BEREKOVEN et al., 2004, 101). The validity test in this study is based on a comparison of the items' computed ranks. The parameters Kendall - τ - b and Spearman's - ρ are taken as indicators (cf. FIELD, 2009, pp. 179). A significant correlation will be taken as positive indicator that both methods deliver similar results. The rank test will be carried out on a two-sided, 0,05, level of significance.

LOUVIERE et al. (2010) published an article discussing the concept of hit rate and suggesting to do not point just on this construct regarding the quality of a research (cf.

LOUVIERE et al., 2010, pp. 57). According to their findings, the hit rate does not have any power in statistical prediction (cf. LOUVIERE et al., 2010, 67). As a result, the hitrate gets shown, but is not a parameter of further interpretation. It will be a interpretation of the values of hit rate, given in the SPSS output and the inconsistency level, recorded by the AHP software ExpertChoice.

6.1 Possible problems occurring during field research

Following points have to be mentioned when preparing a field research, as they can bear errors (cf. BEREKOVEN et al., 2004, pp. 102). Precise questions require a good prepared topic to ensure exact answers as well as unacquainted topics have to be questioned in a general way (cf. BEREKOVEN et al., 2004, pp. 102). A mixed set of open and closed questions helps to prevent biased results (cf. BEREKOVEN et al., 2004, pp. 102). Spontaneous reactions can be recorded but sticking to the topic is a must as the interviewee's benevolence can be exceeded, too (cf. BEREKOVEN et al., 2004, pp. 102). All imaginable situations that may occur, bear the possibility to take influence on the result (cf. BEREKOVEN et al., 2004, pp. 106).

Sampling There are two types of sampling as literature suggests: random and quota based sample (cf. BEREKOVEN et al., 2004, pp. 52). In order to have all statistic methods available without restrictions to unbiasedness, a random sample is required (cf. BEREKOVEN et al., 2004, pp. 55). In this research there are only students in the sample, so there is a relatively homogeneous group concerning education and age. This has to be questioned at any research to ensure its quality (cf. BEREKOVEN et al., 2004, pp. 55). Two types of error can happen during research: systemic and random error – only the second one can be computed (cf. BEREKOVEN et al., 2004, 65).

KALLAS et al. have compared the AHP with choice experiments and found that the answers given when both methods get applied to the same person they were influenced by two effects: learning and fatigue (cf. KALLAS et al., 2011, 190). Rotated designs and switching the order of ranking questions, tasks and objects are strongly recommended (cf. KALLAS et al., 2011, 190).

For the research a sample of students of the University of Natural Resources and Applied Life Sciences in Vienna (BOKU) will be taken. The sample of students will be taken random and the fact that the students are located at two places in town ("Türkenschanze" and "Muthgasse") is taken into consideration. As the university has a focus on life sciences, the number of non-response cases hopefully will not be so high but

this number will also be noted down during the inquiry.
Referring to statistics of the university (cf. UNIVERSITÄT FÜR BODENKULTUR, 2009, 5, 73) we see, that the majority of students comes not from Vienna, consequently when they begin their studies, they move to Vienna and are not living at their parents' house or flat no more: Local residential communities, residential homes for students or alone in a flat. Analyzing the sample according to those living circumstances will be another task for the interpretation, too, as well as where the students originally come from: Nationality, administrative region, rural or urban background.

For each research method a minimal number of 50 valid observations is held to be the minimum to make an assumption. Statistic reports of the university say, there are about 10,000 students registered (UNIVERSITÄT FÜR BODENKULTUR, 2011, sp.). That means with a total of 100 observations, 1 % of them will have the chance to be asked. Referring to cf. TSCHEULIN and BLAIMONT (1993, 845) who examined the results' quality of conjoint studies with regard to the education level of people asked before, the results should be good enough to draw a conclusion for the "population" of students studying at BOKU.

In order to improve the reliability of this inquiry we will do a pre-test, where the open question will be posed: "Which features matter concerning the shopping of fresh milk?". This is done, because it may be that for students there are certain features of fresh milk more important than others and maybe the important ones we have not already considered or found in literature. Ten students per sampling point will be asked, thus thirty altogether, for the pre-test. With regard to education level and students' age, there should not arise a broad divergence.

The before mentioned short inquiry to identify possibly unnoticed feature before the final design is suggested by literature (cf. THEUERKAUF, 1989, 1180). A good research design should not exceed nine different product characteristics with their attribute levels (cf. THEUERKAUF, 1989, 1180). No matter if qualitative or quantitative data is collected, both are able to be integrated into each method (cf. THEUERKAUF, 1989, 1180).

A lot of interest got an article of TSCHEULIN and BLAIMONT who concluded the quality of the results and the validity of conjoint experiments gets influenced by demographics of test persons - especially education and profession (cf. TSCHEULIN and BLAIMONT, 1993, 845). Needless to say this result led to further discussions and SATTLER et al. tried to replicate former findings concerning influences on validity of conjoint experiments (cf. SATTLER et al., 2001, pp. 771). The result of this comprehensive study

was not able to back up TSCHEULIN and BLAIMONT's findings, the difference might be due to low levels of validity (cf. SATTLER et al., 2001, pp. 783).
For the research, 50 students get interviewed with each method. The number of 50 students was taken according following influences:

- KALLAS et al. suggest for a reliable DC experiment at least 30 respondents, for the AHP there may be less respondents acceptable (cf. KALLAS et al., 2011, 185).
- MEISSNER and DECKER conducted a comparing study as well and worked with 61(AHP) and 58(DC) respondents (cf. MEISSNER and DECKER, 2009, s.p.).
- Due to the fact of sampling only within BOKU students, the compareable level in education, an age span of just about ten years as well as interests lying in a similar field of universitary education (life sciences) are constant factors.

THEUERKAUF pointed out that the respondents should be those for who the buying process really bears relevance (cf. THEUERKAUF, 1989, 1182). The students are in a part of their lifes where the most have left home an have to do the shopping themselves. As we saw in the theory on low-involvement products, habits do not get changed so easy; This could be an interesting target group for the companies. The students for the sample will be chosen randomly. It is generally accepted that if your sample is chosen carefully before the datamining, your results will be better (WITTINK et al., 1992, s.p.).
As we compare two methods with a separate sample each, we have to narrow down random influence and externalities in order to have as many as possible of the random factors being comparable. Other studies on this topic are testing both methods with the same sample. In order to exclude effects and bias from this, we try to integrate variation: which method is first and the order of questions within a method as well (cf. CHRZAN, 1994, 171). In this research we vary the order of profiles of the DC experiment and the order of comparisons during the AHP questionary.

6.2 Choice experiments compared with the AHP

In 1991, TSCHEULIN published an article, where he compared CM and AHP in order to spot on the processes' ability for reliable forecast and predictive power in new product design (cf. TSCHEULIN, 1991, pp. 1267). The author presents a table with six studies published in marketing journals which compared a compositional method with a decompositional method (cf. TSCHEULIN, 1991, 1270). The results unfortunately do not

tell which method can be put in favor upon the other (cf. TSCHEULIN, 1991, 1270). He draws his conclusion, that you cannot tell "a priori" which method fits better to your research task (cf. TSCHEULIN, 1991, 1277). TSCHEULIN (1991) summarizes the main findings as follows (cf. TSCHEULIN, 1991, pp. 1277):

- The proband's capacity towards abstract thinking is higher by the AHP than the conjoint experiments.
- By using more or less realistic or just written-down prototypes during the conjoint study this method is better in terms of prediction accuracy. Testing this by connecting this study with buying habits, both methods results' are able to make good predictions.
- Tasks for the probands that are similar during applying the two different methods can cause biased results, the researcher has to cope with. Due to this input, in this research we take two samples, one for each method.

SATTLER et al. (2003, cf. 17) repeated the study of TSCHEULIN and BLAIMONT but could not find a result to agree with their conclusion that demographic variables of the responders have an influence on the validity of the research method. SATTLER et al. add, there need not to be seen a "linkage between demographic variables and preference measurement"

MULYE (1998) compared different methodologies of both methods AHP and CM (cf. MULYE, 1998, pp. 263). Within the work cannot be concluded, that one method outperforms the other concerning prediction validity (cf. MULYE, 1998, 276). Regarding the conjoint experiments, the ranking method works better than than rating method; in general, AHP's results fit better to the ranking process (cf. MULYE, 1998, 276). Clearly the conjoint design was in an inferior position when more attributes were added, but the method was regarded as trustable (cf. MULYE, 1998, 276). Computing the AHP's inconsistency ratio is a measure to classify the result's predictive power (cf. MULYE, 1998, 276).

SCHOLL et al. (2005, 776) studied the AHP and CM within multiattributive design processes and found that each method has its advantages and disadvantages. As well as MULYE (1998) they suggest CM's application to cases with a few alternatives, both derive results which are useful but as the AHP has a wider range in applicability they tend to favor the AHP of CM (cf. SCHOLL et al., 2005, 776). They conclude that the

AHP is easier for the probands, as they just have to compare two levels of a product than two complete ones (cf. SCHOLL et al., 2005, 773). Additionally the reduced cognitive burden by two-level comparisons (AHP), makes this process more flexible and allows to integrate more items into a research (cf. SCHOLL et al., 2005, 776). Or from another point of view: Reduced efforts for probands result in shorter interviews and therefore a more cost-efficient study (cf. SCHOLL et al., 2005, 773). So the AHP may be the preferred method.

MEISSNER and DECKER (2009, s.p.) found in their study that both CM and AHP are at least on the same level concerning prediction quality and validity of the two approaches. AHP seems to be a good tool to forecast market share and suits as well for measuring preference (MEISSNER and DECKER, 2009, s.p.). The duration of interviews was not differing in the study of MEISSNER and DECKER (2009, s.p.). Respondents told that doing the AHP process, they felt more like in a real situation and claimed it appeared to them being closer to the real situation; The people were better motivated as they enjoyed the rating and said it was rather an easy task (MEISSNER and DECKER, 2009, s.p.). Further the authors suggest testing the AHP with probands having a lower level of education, to see if the quality of decisions is as good as with well educated ones (MEISSNER and DECKER, 2009, s.p.).

KALLAS et al. focused on the preferences that make people to buy a product or not, additionally they differentiated between a purchase intention and a preference that was just due to theoretic favor (cf. KALLAS et al., 2011, 181). Choice experiments are focused on buying a product with simple choice tasks, while the AHP seems to be more suitable for rational decisions with higher involvement (cf. KALLAS et al., 2011, 191). When comparing two complex goods, it seems to require more considerate thinking than just comparing two attributes of a product, there was no evidence found which could back up this thought (cf. KALLAS et al., 2011, 191).

For the comparison of both methods, KALLAS et al. (2011) was favored: relative importance of the single attributes is derived from each method and the attributes get ordered according to see if the ranking differs or matches (cf. KALLAS et al., 2011, pp. 188).

The two parameters provided by SPSS' correlation analysis in this case are Kendall - τ - b and Spearman's - ρ (cf. FIELD, 2009, 195). The first one fits better to small data sets so its importance is regarded to be higher (cf. FIELD, 2009, 195).

Another thing is the subjective experienced difficulty from probands' viewpoint – after the interview they are asked to rate the test's difficulty with a number: "easy" corresponds to the value "1" and "diffcult" gets the value "4".

Summary

The chapter shows that AHP as well as DC experiments have their tradition in science and marketing research. For both there are studies suggesting, that one method works better than the other. Reviewing the literature did not show, one method is superior to the other.

B Application of the Method

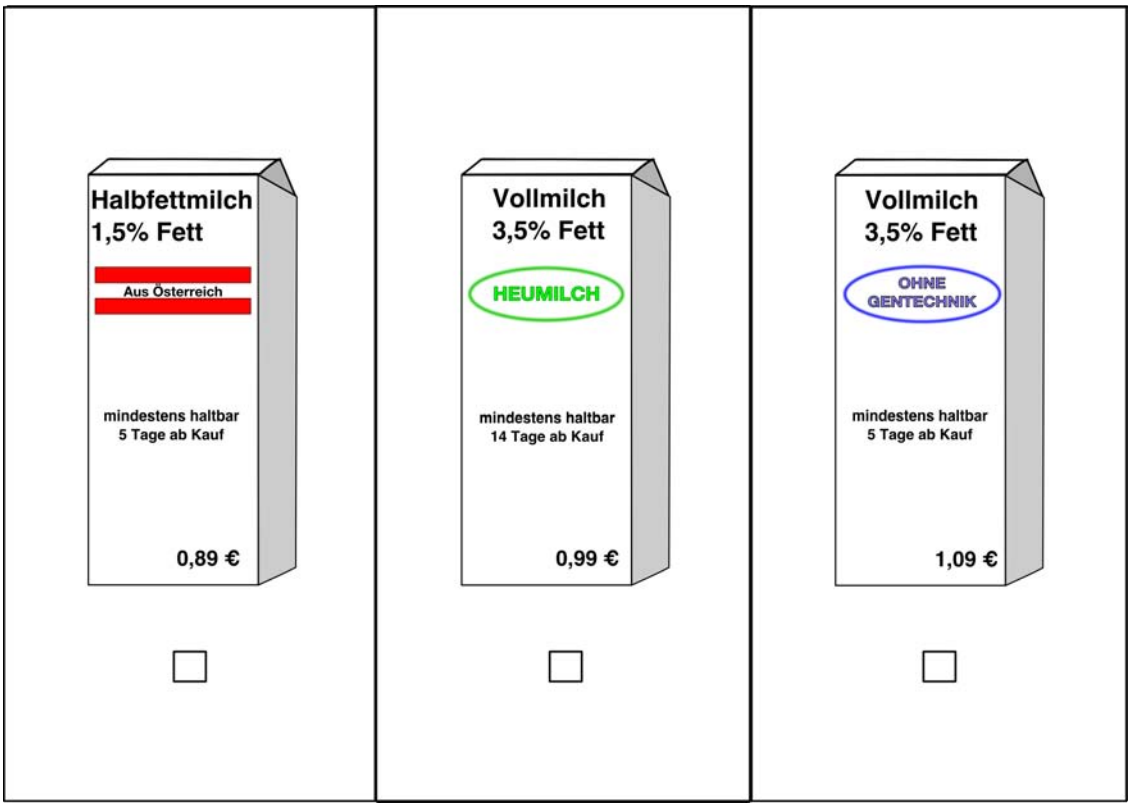
1 Results

In this chapter, at first the results of the two studies carried out get described, beginning with the AHP then DC. At first a demographic overview of the samples is given, then the results are presented in detail. Afterwards the comparison of both is shown in a correlation analysis in order to answer the research question. The ideal products according the methods are presented as well.

Sample parameters Each interviewee was asked about his or her origin to categorize them: rural and urban origin.[7] Right after an interview, each proband had to rate the subjective experienced difficulty of the interview by a number between "1" (= "easy") and "4" (= "difficult"). Furthermore, the average time per interview needed, gets mentioned.

Presentation of the prototypes To make the research more realistic, the three different products were not just described on a sheet of paper, there were three silhouettes of milk packages with the labels put upon them according the attached plan in the annexe. The paperformat A4 was used in landscape format. An example of sheet is shown following:

[7] The number of 5,000 inhabitants was taken to seperate them.



1.1 AHP research

The AHP research was done in the beginning of January 2012 and the same sampling plan as in the choice experiment was used.

Socio demographics The randomly taken sample of 50 respondents is described as following in table 7:

Table 7: AHP sample by numbers (n=50)

sex	♂	♀	∑	origin
	13	9	22	rural
	10	18	28	urban
∑	23	27	50	
Median		⌀ 22.8 years		
Range		[19 – 30] yrs.		
Mode		21 yrs.		
Difficulty		⌀ 1.79		
Time		⌀ 8 minutes		

Interview situation To perform the AHP research there are two possibilities: doing a paper and pencil interview and record the answers and weights or using the EC software package designed for AHP. The paper and pencil method does not have the possibility of performing a consistency check of the decisions, which the software package provides. In order to get good results, we suggest computer aided interviewing. For completing the AHP questionary in our research, an average time of 8 minutes was needed.

Overall rating of the product features Table 8 shows an overview of the categories according their importance for probands. "Label" and "Fat content" were quite similar in importance with a slight advantage for the category "Label". Expiry date and price were ranked in third and fourth place as shown.

Table 8: AHP overall importance

Category	[%]	Importance
fat	27.53	2
expiry date	23.48	3
label	27.56	1
price	21.43	4

Table 9: AHP - labels, pricing, fat content and expiry date

Label	[%]	Rank	Price	[%]	Rank
Austria	9.31	2	0.89,-	5.78	2
Heumilch	4.99	3	**0.99,-**	5.79	**1**
Non-GMO	12.26	**1**	1.09,-	5.16	3
Cow	2.80	4	1.19,-	4.47	4
Fat content			Expiry date		
1.5%	11.00	2	5 days	10.41	2
3.5%	16.02	**1**	**14 days**	12.90	**1**

A detailed view[8] is presented in table 9.

Within the labels, "non-GMO" was ahead. In second place, "Austria", "Heumilch" and

[8]The percentages shown, might not reach the total of 100.0 due to losses throughout computation and rounding within the program and its algorithms.

"picture of a cow" followed. Concerning pricing, the lower price levels were preferred to the two higher ones with 0.99 Euro in first place. The higher price levels were preferred as shown: the most expensive at least. Especially in the category pricing the people were partly not motivated to give differentiated answers during the questionary. The avoided to draw decisions by marking the level "1" for equal. Of course there were respondents saying, it does not matter for them if the product is cheap, too. The two proposed levels of fat and expiry date of the product were chosen as below. The higher level in both, fat and expiry date – "3.5%" and "14 days" got preferred.
The overall inconsistency index, measuring the fit of the decisions made, was in average 0.06. All of the questionaries were below the level of 0.10.

1.2 Discrete Choice Experiment

The discrete choice experiment was done on the campus of BOKU Vienna in december 2011 according to the sampling plan attached in the annex.

Socio demographics The randomly taken sample of 50 respondents is described as following: Each person had to make 16 buying decisions out of 48 products presented

Table 10: DC sample by numbers (n=50)

Sex	♂	♀	$\sum$	Origin
	18	7	25	rural
	7	18	25	urban
$\sum$	25	25	50	

Range	[19 . . . 30] years
Median	⌀ 22.86 years
Mode	20 years
Difficulty	⌀ 1.70
Time	⌀ 7 minutes

arranged in three per sheet of paper. That is 800 purchase decisions in sum of a total choice amount of 2400 items. Consequently the random choice probability of an item is 0.33, no-choice accordingly at 0.66, which is important to know when looking at classification results of the model.

Category variable: Labels At the beginning it can be useful to have a glance at the variables of the overall choice decisions to get an overview. For all the category variables the function "crosstabs" was used with respect to the dependent variable "purchase". The shares and numbers how often the items were chosen are shown in the table above. Following graph shows how often each label got chosen during the choice experiment. The product labelled with the Austrian flag is in first place, second and third place, but different in just one vote, "Heumilch" and "non-GMO". The last place, with a notable interval behind, the "picture of a cow" is found. The label with the country's flag is clear ahead the others and its dominance is obvious. "Heumilch" beat "Non-GMO" with slight advantage, hence the "Heumilch" label does not provide so much information for the consumers.
Focussing the pricing of our products, a majority of probands chose the second cheapest level. Notable is the most expensive price level is not the less chosen one. Concerning fat content, the 3.5% variety and with respect to expiry date the longer shelflife version is preferred.

Table 11: DC: Choice among labels and price

Label	[%]	Rank	Price	[%]	Rank
Austria	36.5	**1**	0.89,-	26.1	2
Heumilch	23.1	2	**0.99,-**	28.3	**1**
Non-GMO	23.0	3	1.09,-	22.4	4
Cow	17.4	4	1.19,-	23.2	3
Fat content			Expiry date		
1.5%	26.6	2	5 days	48.3	2
3.5%	73.4	**1**	**14 days**	51.7	**1**

Correlations The variables were processed in a nonparametric correlations matrix and examined with respect to the category "purchase". Variables processed were "age" of the respondents, "fat content", "expiry date" and "price" of the product. Table 12 shows the details for the two significant correlating parameters "price" and "fat content". "Fat content" bears a positive sign before its numerical value, this positive correlation shows that a higher fat content is going along with higher preference. Other way round when regarding the "price" variable: Higher costs get less preferred – negative correlation. The correlation on "fat content" is more significant than that on "price".

The expiry date of fresh-milk does show an incoherent connection towards "purchase", the variable "age" is left out as there was no correlation found.

Table 12: Discrete choice – Correlation coefficients

	Pearson	Kendall - τ - b	Spearman - ρ
Price	-,046*	-,042*	-,046*
Fat content	,331**	,331**	,331**
Expiry date	,025	,025	,025
*significant at 0.05			
**significant at 0.01			

Individual result Within the DC sample, the age group with 20 years old is the largest; For the interpretation on individual level, we chose randomly. The person is female, at the age of 20 years and has an urban background. At first, we reduce the data in SPSS to the 48 decisions (32x non-purchase and 16x purchase) of one proband. The probability of buying a milk product in our case is one third (0.33) as probands choose one product out of three possible ones, consequently the probability of no–choice is two third (0.66).
The procedure needed for our analysis is the "Binary Logistic Regression", "purchase" as the binary, dependent variable[9] and the before identified metric variables price and fat as well as the information that bears the variable "label". The variable "label" was coded as dummy-variable.

Table 13: Discrete choice – Individual

-2LogLikelihood (-2*LL)	Cox & Snel-R^2	Nagelkerkes R^2	McFadden R^2
61,105 (start)			
20,380 (final)	,572	,794	,667

As the interpretation of a linear regression function is not the same in the logistic case, the equation with the coefficients is left out to prevent irritation (cf. BACKHAUS et al., 2011, 256). After the regression both, the logits and probabilities of purchase are shown in figure 9. The graph proofs that probability of choice in our model

[9] 0: "non-purchase" , 1: "purchase"

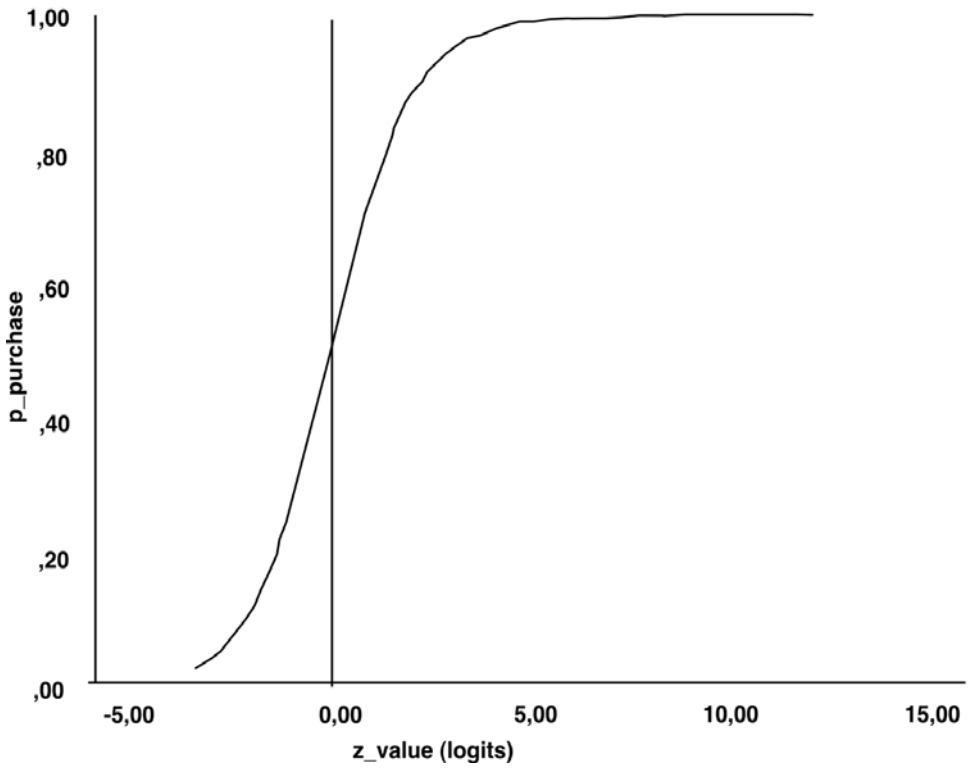


Figure 9: Logistic curve of the choice probabilities

can be pictured with a curve in characteristic "S"–shape. [10]

The results of the statistic parameters are listed and explained following: The value -2LogLikelihood is compared with that of the χ^2 table at level 0.05 which reads "55,76"[11] – our model's is reported at 20,380 – consequently we accept H_0, that our model bears a good fit.

Likelihood-ratio-test for our case reports:

$$LL_0 = 61,105 \quad LL_1 = 20,380 \quad |LL_0 - LL_1| = 40,725$$

40,725 $\succcurlyeq \chi^2_4$ 9,49 H_1 Has to be accepted, the coefficients are **not** zero.

Hosmer-Lemeshow test with the value $\chi^2 = ,000$ and significance is 1.000, reports the difference between predicted and observed decisions, in our case all decisions could be predicted with the model, none was incorrect.

[10] For example the application of a linear regression model on this dataset leads to a value for R^2 which is lower than 0,5.

[11] χ^2 at 40 degrees of freedom

The correctly predicted decisions were in 91.7% of the cases correct, "no-purchase" was classified incorrect in 8,3 % out of the 48 decisions.

The Press's Q test shows following value: 33,39 [12] that exceeds the critical value of tabelled $\chi^2 = 5.99$, so the classification differs significantly from a random classification.

Pseudo-R^2 statistics are listed following:

- McFadden-R^2: $0,667$ [13]
- Cox & Snel-R^2: $0,527$
- Nagelkerkes R^2: $0,794$

According those three parameters, we can say our model fit is very good.

1.3 Discrete Choice vs. AHP

If looking at the average time needed for an interview, the DC experiment needed less, the AHP method required more time. The difference between the methods was about one minute with the DC accounting for seven minutes, the AHP in average one minute in addition.

Research question "Do both methods lead to the same result?" After regarding the analysis, we can conclude that both methods lead to very similar results. They are not exactly the same, but show a very strong correlation.

The rank correlations can be tested one or two-sided by the help of new introduced variables. In SPSS we create in a new file one column for the DC experiment, the other for the AHP. In each row the ranks of the different corresponding levels are inserted. Those ranks should show a certain amount of correlation, at least there should be a correlation at the level of 0,05. With the help of this small table we can compare the two overall results of the 50. If comparing the ranks manually, 50% of them are the same. Table 14 shows the results from a correlations analysis in SPSS and we can conclude,

[12] $[48 - (48 \cdot 2 \cdot 0.917)]^2 / 48$ = 33,39
[13] $1 - \frac{20,380}{61,105} = 0,667$

both methods lead to significant correlation results. Both statistic parameters indicate a good correlation.

Table 14: DC and AHP – Correlations

Parameter	Coefficient	Level of significance
Kendall - τ - b	,615*	,05 (two tailed)
Spearman's - ρ	,689*	,05 (two tailed)
*significant correlation		

Hit rate The theoretical construct of the hitrate is an often taken measure to measure the predictive capacity of a theoretical model to predict decisions correctly. In traditional conjoint analysis this parameter of measurement is discussed very much (cf. LOUVIERE et al., 2010, 67). The hit rate measures if predictions of the model matches the choices made before. The hit rate for the DC experiment is reported by SPSS with a value for correctly predicted results, in this study 91.7% of all decisions. The chosen product gets compared with the AHP's results if the ranking was consistent or not. This was done in EXCEL. Table 15 shows the result, with DC outperforming the AHP, more than 90% (DC) vs. 60% (AHP).

Table 15: DC and AHP – Hit rate

	Hit rate in [%]	Rank
Discrete Choice	91.7	**1**
AHP	60.0	2

In order to answer the research question from the beginning, the conclusion is that both methods lead to similar results that are not exactly the same. The correlation within both is very high. Both results seem to be valid according the statistical parameters. The AHP's check for inconsistency within the ratings as well as the number of decisions that was predicted correctly shows that each method performed very good.

1.4 Ideal products according the results

In table 16 the results are brought together, showing the ideal product according the research: The products do not differ very much, what was already shown by the cor-

Table 16: Ideal products according AHP and DC

	AHP	DC
Fat content	3.5%	3.5%
Label	non-GMO	Austrian origin
Price	0.99,-	0.99,-
Expiry date	14 days	14 days

relation analysis. The only difference regarding the assembled product from the single pieces is found in the category "label". While the AHP demanded for "non-GMO", the DC was marked with "Austrian origin".

2 Discussion

2.1 Research situation

Each sample was drawn randomly on the campus of BOKU Vienna, the DC experiment was carried out in December 2011 by face-to-face interviews. The AHP inquiry in the beginning of January 2012. Rejected or incomplete interviews just happened marginal and were sorted out in order to have 50 valid interviews each. The students were easy to convince of take part in the research; Getting the random sample was not a big problem.
Additionally the DC experiment and the AHP research was carried out separately, so there was no choice for the probands whether to choose to take part in a certain method.

Interview situation Asking the students if they want to take part in the research, there was just a small number of persons refusing to take part. The students enjoyed going through the choice tasks, there was a time span from 6 to 9 minutes for the majority of the interviews. The found correlation in ranks, 60.0% is comparable to a study of KALLAS et al. (2011), who has computed a level of 55.6% in rank correlation in his research on a food product (cf. KALLAS et al., 2011, 188).

Sample As concerning sociodemographics both samples are very similar, the results should be comparable as was described before. The experienced difficulty in each interview situation was quite similar, with the AHP experienced a little more difficult than the DC experiment: 1.79 vs. 1.70. (MORANA et al., 2007) found a similar result in his study when comparing both methods (cf. MORANA et al., 2007, 52). The argument that the AHP is easier for the probands cannot be rejected, nor backed up due to the close distance. Although the difference is not very large, the argument of paired comparisons being easier to manage for probands cannot be backed up. This conclusion is not surprising, numerous probands made the tradeoff by inserting just the value "1" for example concerning "price".

Having a closer look at the single categories in the DC-experiment now. The category "Label" got dominated by the sign showing "Austria" or Austrian origin. In second place with almost the same percentage are "Heumilch" and "Non-GMO", what is remarkable considering the fact that the "Heumilch" label has not been so long on the market. Perhaps many people, so the probands, too, associate "Austria" automatically

with "Non-GMO" without having the information. The price categories show that not the cheapest milk was preferred most and that the most expensive was not in last place.

2.2 Discrete Choice

As suggested by BALDERJAHN et al. (2009, 140) DC research design and evaluation was done separately: The design was done according STREET et al. (2005), the data became analyzed by the PASW/SPSS 18 software package. The three items to choose within were designed like packages of fresh milk in order to look as real as possible as suggested in literature.
At the beginning a pre-test should help to indicate sources for mistakes or if the task of choosing one product out of the three presented was clearly communicated and easy to do for the probands. As the responses from the probands were positive as well as the task was not overwhelming them, the study was continued until the no. of 50 interviews was reached.

CHRZAN researched on order effects in studies applying CBC and suggested to vary order of profiles as well as the order of attributes within product concepts (cf. CHRZAN, 1994, pp. 165). Unfortunately the amount of influence of the different effects in order is not known (cf. CHRZAN, 1994, 171). The author mentions that in some product category a variation of the order or attributes may cause irritation among probands (cf. CHRZAN, 1994, 171). The order within profiles in this research was randomized during the research to avoid unrecorded influences (cf. BORTZ and DÖRING, 2006, 54).

For processing DC there exists a software package supporting the complete process: design, inquiry and data processing (cf. BALDERJAHN et al., 2009, pp. 135). The price might frighten off as it is found beyond 5,000 $ (cf. BALDERJAHN et al., 2009, 136). With a smaller budget you have to do design, datamining and processing separately with the help of literature, a paper and pencil interview and SPSS or the free statistical package R (procedure: regression) (cf. BALDERJAHN et al., 2009, 136).
It seems to be more realistic for probands to have a complete image or description of a product when making decisions or trade-offs, instead of just rating two single features; This was stated, too, by MORANA et al. (2007, 52)

2.3 AHP

The AHP research was realized with a laptop running the software ExpertChoice on it. Before starting, the respondents need to be instructed about details in the rating process. The software in general is not too complex; To get started without big delay, the book from MEIXNER and HAAS (2002) can be a helpful source for explanation. All in all there is just a little amount of time needed to get behind the software's clues for a good workflow. Additionally decisions recorded can be imported to proceed further with the software. Unfortunately the software package is not available for free and at least 495 US-$ need to be invested, students have the possibility to get a "light-version" for less money (cf. BRINKMEYER and MUELLER, 1994, 89). In case a decision requires not so many interviews, the calculation can be realized in EXCEL, too.
The AHP seems more suitable to complex decision problems. With students as probands this research was realizable, but in-store interviews perhaps are not so easy to realize. Additionally, a low involvement product as milk should be replaced by a high envolvement product. A complex decision method applied on a simple case like purchase of milk, seems to "overwhelm" or confuse probands. Further, it is regarded to fit better with small teams where the members are really into a problem or face a difficult situation. Low involvement products seem to overwhelm probands, as the people do not consider the purchase so much. For example the matrix with the decisions on price levels was rated with the judgement "1" or "equal" for several times. That might indicate that for "pricing", being on fourth place in overall importance, the probands avoid a complex trade-off by inserting the value "1". Further it could indicate four price levels being very close in combination with a low-involvement product as fresh milk, this question should be adjusted in other researches: more distance or fewer levels.
So, within the AHP there can be assumed, there is a connection within the labels: Austria and GMO-free seem to interfere, what obviously violates the rule of all variables need to be independent. By contrast, the DC results do not show this.

Applying the AHP, using the software package EXPERT CHOICE is useful. The software enables you to design the hierarchy very quick and the amount of time needed for getting used to the program is not too high. Further the software enables probands to choose how they want to do the comparisons: graphical, numerical weights or described with words. This adds further precision to the ratings. Additionally, using the software has the advantage of an integrated consistency check: Inconsistent decisions can be adjusted in order to have reliable results with the help of the proband. It is highly recommended to use this feature during datamining and explain to the respon-

ders what "inconsistency" means. As everyone taking part is irritated when he might be told his decisions are not good, explanation is seen to be very helpful.

Concerning the interview situation, the use of a computer during posing the questions is something interesting for the relatively young probands. Computers are part of any student's live and so we could say there is no irritation of probands with this type of interview situation. Probands liked getting through the questions but were irritated by the consistency check. It was necessary to inform the people what this consistency check does, as nobody taking part in an interview wants to hear he gave bad answers. As reason to this point, the use of the AHP in a mass investigation is regarded to be perhaps a little complex, as probands are faced with too much abstract things.

The AHP seems to be a research tool which cannot be used with probands or researchers being completely unaware what they have are doing. The AHP's probands faced some difficulties with respect to the DC experiment, which might be due to observed behavior during the AHP:

- Probands were irritated with the circumstance of the Austrian flag being an independent information with respect to the other labels. Non-GMO seems to be very close related to Austrian origin.
- The different categories and especially the price were not so easy to differentiate for the probands.
- The value "1" or "equal" was chosen quite often during the AHP method to avoid decisions in e.g. pricing of the fresh milk product.

2.4 Discussion of the methods

Discrete Choice experiment seems to be a well fitting method for researching on a low involvement product as fresh milk. The information for the probands can be displayed easily and probands enjoyed going through the questionary. About three types of behavior could be identified:

1. Probands going pretty fast through the whole questionary.
2. A second group that considers notably longer.
3. The third, who went through the first choice tasks pretty fast, hesitate and take more time for the second half of the tasks.

4. Doing the interviews with paper and pencil was something probands enjoyed.

During the research there was one group among the sample doing the choices quite fast and another who need notably more time for their tasks. A third group took more time to consider. The time needed for the questionary was about seven minutes in average.

Products with their features that got chosen can be analyzed with functions of the software EXCEL: The share of each item can be computed easily and for example visualized by using bar diagrams. The DC results for an individual have to be transferred into a SPSS-sheet and a binary logistic regression has to be carried out.

Often, probands went through the first choice tasks pretty fast but interrupted when for example they noted the switching within labels or prices and had to reconsider their own decisions. So some sort of "learning effect" how the profiles switch and how probands put importance to their decisions was recorded.

Having researched a low-involvement product as fresh-milk in this study, following suggestions can be made:
Discrete Choice would be the method which should get applied for a low involvement food product. The choice task was easy to explain and probands had fun going through it. In addition, a paper and pencil questionary is more personal than a laptop based inquiry. DC provided a quick and easy questionary probands doing for their own, without long explanation, questions and irritations. Design and research process was not bundled in one software package but this was no problem during the research.

AHP would notbe first choice or suggested for a research on low-involvement products. As the method requires more considerate answers and it did not perform better than the DC experiment, the suggestion is, to use it in studies on high-involvement products. Less interviews, but more into depth. Additionally, the AHP needs computer support. Even if people are familiar with computers and laptops, but during the research an interview done with a sheet of paper and pencil created a much more relaxed atmosphere.

Further investigation could focus a product from the food market with a higher involvement than fresh milk – perhaps the AHP is the method performing better than DC.

3 Summary

This master's thesis focused on the comparison of two popular methods for market research: Analytic Hierarchy Process (AHP) and Discrete Choice (DC).
Both methods were applied to a sample of BOKU students in Vienna with the research topic "fresh milk". The food market and its actors got in the focus of the first chapters. Consumers with their shifting needs make the companies develop new products. The other way round, companies try to satisfy the consumers' demand for new products and focus different niches. A review on literature, an observation of the market for fresh milk as well as among the target group, BOKU students, lead to the definition of the research attributes: Fat content (1.5% / 3.5%), Expiry date (5 days / 14 days), Price (0.89,- / 0.99,- / 1.09,- / 1.19,-) and Label (Austrian flag / Heumilch / non GMO / picture of a cow).

The sampling, 50 individuals per method, was done in a rather similar population the methods and results got compared, without having a learning bias effect within the sample. Both methods lead to similar results: The ideal product for fresh milk has a fat content of 3.5%, a price of 0.99 Euro per liter and an expiry date of 14 days. The AHP's probands demanded for a label "non GMO", the DC's result bears an "Austrian flag" on the package. Both methods compared with correlation tests show significant results on the two tailed 0,05 level.

The parameters for the quality and fit of the methods were an average inconsistency index of 0.06 of the AHP, and a 91.7% hit rate within the compared individual DC result.

The AHP research was rated to be more difficult than the DC by the respondents. Nevertheless, both methods work well, have their advantages and deliver good results. For researching on low-involvement products the DC experiment is favourable in respect to ease of use for the respondents.

References

ADDELMAN, S. (1962): Orthogonal Main-Effect Plans for Asymmetrical Factorial Experiments. In: Technometrics, 4, Nr. 1, 21–46.

AMA (2009): Jahresbericht Milch und Milchprodukte. Wien: online ⟨URL: http://www.ama.at/Portal.Node/ama/public?gentics.rm=PCP&gentics.pm=gti_full&p.contentid=10008.80376&9b_Jahresbericht_2009.pdf⟩ – visited on 13.04.2011.

BACKHAUS, K., ERICHSON, B., PLINKE, W. AND WEIBER, R. (1994): Multivariate Analysemethoden: Eine anwendungsorientierte Einführung. 7th edition. Berlin/Heidelberg: Springer Verlag.

BACKHAUS, K., ERICHSON, B., PLINKE, W. AND WEIBER, R. (2011): Multivariate Analysemethoden: Eine anwendungsorientierte Einführung. 12th edition. Berlin [a.o.]: Springer Verlag.

BALDERJAHN, I., HEDERGOTT, D. AND PEYER, M. (2009): Chap. Choice-Based Conjointanalyse In Conjointanalyse: Methoden, Anwendungen, Praxisbeispiele. Berlin [u.a.]: Springer Verlag, 129–146.

BALLING, R. (2004): Regionalität als Marketinginstrument. In: Erfolgsstrategien für Lebensmittel. Frankfurt (Main): DLG-Verlag, 67–80.

BAMBERG, G. AND COENENBERG, A.G. (1996): Betriebswirtschaftliche Entscheidungslehre, 9. überarb. Auflage. München: Vahlen, WiSo Kurzlehrbücher : Reihe Betriebswirtschaft.

BARZILAI, J. (1998): On the decomposition of value functions. In: Operations Research Letters, 22, 159–170.

BEN-AKIVA, M. AND BOCCARA, B. (1995): Discrete choice models with latent choice sets. In: International Journal of Research in Marketing, 12, 9–24.

BEREKOVEN, L., ECKERT, W. AND ELLENRIEDER, P. (2004): Marktforschung, methodische Grundlagen und praktische Anwendung. 10th edition. Wiesbaden: Gabler/GWV Fachverlage GmbH.

BESCH, M. AND HAUSLADEN, H. (2002): Wettbewerbsvorteile im regionalen Lebensmittelmarketing - Competitive advantages in local food marketing. Wien: online ⟨URL: http://oega.boku.ac.at/fileadmin/user_upload/Tagung/2001/besch.pdf⟩.

BLAIR, A. R., MANDELKER, G. N., SAATY, T.L. AND WHITAKER, R. (2010): Forecasting the resurgence of the U.S. economy in 2010: An expert judgment approach. In: Socio-Economic Planning Sciences, 44, 114–121.

BODIN, L. AND GASS, S.I. (2003): On teaching the analytic hierarchy process. In: Computers & Operations Research, 30, 1487–1497.

BORTZ, J. AND DÖRING, N. (2006): Forschungsmethoden und Evaluation für Human- und Sozialwissenschaftler. 4th edition. Heidelberg: Springer Medizin Verlag.

BRINKMANN, B. AND KUHLMANN, M. (1983): Die "Konjuktur" der H-Milch. In: Deutsche Milchwirtschaft (DMW), 32, 1050–1054.

BRINKMEYER, D. AND MUELLER, R.A.E. (1994): Entscheidungsunterstützung mit dem AHP. In: Zeitschrift für Agrarinformatik, 5, 82–92.

BROCKHAUS (2006): Brockhaus-Enzyklopädie. Band 29: VERTI - WETY. 21., völlig neu bearbeitete Auflage. Leipzig/Mannheim: F.A. Brockhaus.

CALANTONE, R.J., BENEDETTO, C. A. DI AND SCHMIDT, J.B. (1999): Using the Analytic Hierarchy Process in New Product Screening. In: Journal of Product Innovations Management, 16, 65–76.

CHRZAN, K. (1994): Three Kinds of Order Effects in Choice-Based Conjoint Analysis. In: Marketing Letters, 5, Nr. 2, 165–172.

CIIA (2010): Data & Trends of the European Food and Drink Industry. Brussels: online, Confederation of the food and drink Industry of the EU ⟨URL: http://www.clusteralimentariodegalicia.org/images/tab-home/2-datatrends2011.pdf⟩.

COOPER, R. G. (2004): Product Leadership: Pathways to Profitable Innovation (2nd Edition). New York: Basic Books (Perseus Book Group).

DEIX, C. (2009): Konsumentenwahrnehmungen von Schaf- und Ziegenmilch. Master's thesis, University of Natural Resources and Applied Life Sciences (BOKU), Vienna.

DILLER, H. (2001): Der moderne Verbraucher - Neue Befunde zum Einkaufsverhalten. Nürnberg: GIM (Gesellschaft für Innovatives Marketing e.V.), Marketingforschung aktuell.

DYER, R. F. AND FORMAN, E. H. (1991): An Analytic Approach to Marketing Decisions. Englewood Cliffs: Prentice-Hall.

EISENFÜHR, F. AND WEBER, M. (1999): Rationales Entscheiden. 3., neubearbeitete und erweiterte Auflage. Berlin/Heidelberg: Springer-Verlag.

EUROPÄISCHE GEMEINSCHAFT (2004): Verordnung (EG) NR. 853/2004. Bruxelles: online ⟨URL: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:139:0055:0205:DE:PDF⟩ – visited on 30th April 2011.

EUROPEAN COMMISSION (2011): Food industry; EU food market overview. Brussels: online ⟨URL: http://ec.europa.eu/enterprise/sectors/food/eu-market/index_en.htm⟩.

FIELD, A. (2009): Discovering Statistics Using SPSS. 3rd edition. London [a.o.]: SAGE.

GALIZZI, G. AND VENTURINI, L.; RAMA, R., EDITOR (2008): Chap. Nature and Determinants of Product Innovation in a Competitive Environment of Changing Vertical Relationships In Handbook of Innovation in the Food and Drink Industry. New York: Haworth Press, 51–70.

GOLDEN, B. L. (1989): The Art and Science of Decision Making - The Analytical Hierarchy Process. In: The Analytic Hierarchy Process - Applications and Studies..

GRASSL, H. AND SCHAAL, M. (2010): Marketing als Moralisierung der Märkte - Beispiel Milchwirtschaft. In: Financial Times Deutschland,, s.p..

GREEN, P. AND TULL, D. (1982): Methoden und Techniken der Marketingforschung. 4. Auflage. Stuttgart: C.E. Poeschel Verlag.

GREEN, P.E. AND SRINIVASAN, V. (1990): Conjoint Analysis in Marketing: New Developments With Implications for Reserach and Practise. In: Journal of Marketing, 54, Nr. 4, 3–19.

GRIFFIN, A. (1997): PDMA Research on New Product Development Practices: Updating Trends and Benchmarking Best Practices. In: Journal of Product Innovations Management, 14, 429–458.

GRUNERT, K.G. (1995): Food Quality: A Means-End Perspective. In: Food Qualily and Preference, 6, 171–176.

GRUNERT, K.G. (2002): Current issues in the understanding of consumer food choice. In: Trends in Food Science & Technology, 13, 275Ð–285.

GRUNERT, K.G. (2005): Food quality and safety: consumer perception and demand. In: European Review of Agricultural Economics, 32, Nr. 3, 369Ð–391, MAPP, Aarhus School of Business, Aarhus: Denmark.

GRUNERT, K.G., HARTVIG LARSEN, H., MADSEN, T.K. AND BAADSGAARD, A. (1996): Market Orientation in Food and Agriculture. Boston/Dodrecht/London: Kluwer Academic Publishers.

HAAS, R. AND WEAVER, R.D. (2010): Private Labels: A Sign of Changing Times. Innsbruck-Igls: Austria, 2010 International European Forum ⟨URL: http://econpapers.repec.org/RePEc:ags:iefi10:100586⟩.

HAEDRICH, G., KUSS, A. AND KREILKAMP, E. (1986): Der Analytic Hierarchy Process. Ein neues Hilfsmittel zur Analyse und Entwicklung von Unternehmens- und Marketingstrategien. In: Wirtschaftswissenschaftliches Studium (WiSt), Heft 3, 120–126.

HAEDRICH, G., TOMCZAK, T. AND KAETZKE, P. (2003): Strategische Markenführung - Planung und Realisierung von Markenstrategien. Volume 3. vollständig überarbeitete, erweiterte und aktualisierte Auflage, Bern: Haupt Verlag / UTB.

HARTMANN, A. AND SATTLER, H. (2002): Commercial Use of Conjoint Analysis in Germany, Austria and Switzerland. In: Reserach Papers on Marketing and Retailing, Vol. 006, 1–14 ⟨URL: http://uni.uni-hamburg.de/fachbereiche-einrichtungen/fb03/ihm/RP6.pdf⟩ – visited on 15.05.2011.

HO, W. (2008): Decision Support: Integrated analytic hierarchy process and its applications – A literature review. In: European Journal of Operational Research, 186, 211–228.

HUBER, J. (2005): Conjoint Analysis: How We Got Here and Where We Are (An Update). Utah ⟨URL: http://www.sawtoothsoftware.com/download/techpap/howwegot2.pdf⟩ – visited on 02.05.2011.

HUIZINGH, E. K. R. E. AND VROLIJK, H. C. J. (1997): Extending the Applicability of the Analytic Hierarchy Process. In: Socio-Economic Planning Science, 31, Nr. 1, 29–39.

KALLAS, Z., LAMBARRAA, F. AND GIL, J.M. (2011): A stated preference analysis comparing the Analytical Hierarchy Process versus Choice Experiments. In: Food Quality and Preference, 22, 181–192.

KLEIN, M. (2002): Die Conjoint-Analyse: Eine Einführung in das Verfahren mit einem Ausblick auf mögliche sozialwissenschaftliche Anwendungen. In: ZA-Information. Volume 50, Köln: Zentralarchiv für Empirische Sozialforschung, 7–45.

KOTLER, P., BLIEMEL, F. AND KELLER, K.L. (2007): Marketing-Management, Strategien für wertschaffendes Handeln. Volume 12. aktualisierte Auflage, München: Pearson Studium.

LEBENSMINISTERIUM (2010): Grüner Bericht 2010, Bericht über die Situation der österreichischen Land- und Forstwirtschaft. Wien ⟨URL: http://www.gruenerbericht.at/cm2/index.php?option=com_docman&task=doc_download&Itemid=27&gid=418⟩ – visited on 01.06.2011.

LIENERT, G.A. (1967): Testaufbau und Testanalyse, 2. Aufl. Weinheim/Berlin: Verlag Julius Beltz.

LIENHARDT, J. (2004): The food industry in Europe. In: Statistics in focus: Industry, Trade and Services, 39, 1–7.

LOUVIERE, J.J., FLYNN, T.N. AND CARSON, R.T. (2010): Discrete Choice Experiments Are Not Conjoint Analysis. In: Journal of Choice Modelling, 3, Nr. 3, 57–72.

LUCE, R.D. AND TUKEY, J.W. (1964): Simultaneous Conjoint Measurement: A New Type of Fundamental Measurement. In: Journal of Mathematical Psychology, 1, 1–27.

MAIER, G. AND WEISS, P. (1990): Modelle diskreter Entscheidungen: Theorie und Anwedung in den Sozial- und Wirtschaftswissenschaften. Wien, New York: Springer Verlag.

MEINDL, I. (2009): Motive und Werte zum Verzehr von Functional Food und biologischen Lebensmitteln. Master's thesis, University of Natural Resources and Applied Life Sciences (BOKU), Vienna.

MEISSNER, M. AND DECKER, R. (2009): An Empirical Comparison of CBC and AHP for Measuring Consumer Preferences. No address in.

MEIXNER, O. (2000): Das Abwechslungsbedürfnis der Konsumenten im Lebensmittelbereich (variety seeking behaviour). Wien ⟨URL: http://www.boku.ac.at/mi/fp/var_seek/meixner_var-seek.pdf⟩ – visited on 13.04.2000.

MEIXNER, O. AND HAAS, R. (2002): Computergestützte Entscheidungsfindung. Expert Choice und AHP - innovative Werkzeuge zur Lösung komplexer Probleme. Frankfurt/Wien: Redline Wirtschaft bei Ueberreuter.

MEIXNER, O. AND HAAS, R. (2010): Wissensmanagement und Entscheidungstheorie. Wien: Facultas Verlags- und Buchhandels AG.

MELLES, T. AND HOLLING, H. (1998): Einsatz der Conjoint-Analyse in Deutschland. Münster ⟨URL: http://www.conjointanalysis.net/CANet/Manuskripte/CAEinsatz.pdf⟩ – visited on 14.05.2011.

MILLER, G. A. (1955): The Magical Number Seven, Plus or Minus Two - Some Limits on Our Capacity for Processing Information. In: Psychological Review, 101, Nr. 2, 343–352.

MORANA, D., MCVITTIEA, A., ALLCROFT, D. J. AND ELSTON, D. A. (2007): Quantifying public preferences for agri-environmental policy in Scotland: A comparison of methods. In: Ecological Economics, 63, 42–53.

MULYE, R. (1998): An Empirical Comparison of Three Variants of the AHP and Two Variants of Conjoint Analysis. In: Journal of Behavioral Decision Making, 11, 263–280.

NESTLÉ (2008): Nestlé Studie 2009 Ernährung in Deutschland 2008. Frankfurt (Main): Nestlé Deutschland AG – Studie.

N.N. (2011): Heumilch: Absatz gestiegen. Vienna: online ⟨URL: http://www.handelszeitung.at/ireds-110493.html⟩.

N.N. (2012): Hohe Wiederkaufsrate bei Heumilch. Vienna: online ⟨URL: http://www.handelszeitung.at/ireds-118197.html⟩.

OSSADNIK, W. AND LANGE, O. (1999): AHP-based evaluation of AHP-Software. In: European Journal of Operational Research, 118, 578–588.

PICHLER, A. (2009): Der gesundheitliche Stellenwert von Milch im Spannungsfeld zwischen wissenschaftlichem Diskurs und öffentlicher Meinung Ð eine qualitative

und quantitative Imageanalyse. Master's Thesis University of Natural Resources and Applied Life Sciences (BOKU), Vienna.

RAMA, R. AND TUNZELMANN, N., VON; RAMA, R., EDITOR (2008): Chap. Empirical Studies of Innovation in the Food and Beverage Industry In Handbook of Innovation in the Food and Drink Industry. New York: Haworth Press, 13–49.

ROMMELFANGER, H. J. AND EICKEMEIER, S. H. (2002): Entscheidungstheorie - Klassische Konzepte und Fuzzy-Erweiterungen. Berlin/Heidelberg: Springer Medizin Verlag.

SAATY, T. L. (1979): Applicatios of Analytical Hierarchies. In: Mathematics and Computers in Simulation, 21, 1–20.

SAATY, T. L. AND OZDEMIR, M.S. (2003): Why the Magic Number Seven Plus or Minus Two. In: Mathematical and Computer Modelling, 38, 233–244.

SAATY, T.L. (1996): The Analytic Hierarchy Process. Multicriteria Decision Making - Planning, Priority Setting, Resource Allocation. Pittsburgh (PA): RWS Publications.

SAATY, T.L. AND VARGAS, L.G. (1991): Prediction, projection and forecasting - Applications of the Analytic Hierarchy Process in Economics, Finance, Games and Sports. Boston/Dordrecht/London: Kluwer Academic Publishers.

SATTLER, H., HENSEL-BÖRNER, S. AND KRÜGER, B. (2001): Die Abhängigkeit der Prognosegüte von Conjoint-Studien von demographischen Probanden-Charakteristika: Neue empirische Befunde. In: Zeitschrift für Betriebswirtschaft (ZfB), Heft 7; 71. Jahrgang, 771–787.

SATTLER, H., HENSEL-BÖRNER, S. AND KRÜGER, B. (2003): Die Abhängigkeit der Validität von Conjoint-Studien von demographischen Probanden-Charakteristika: Neue empirische Befunde. Hamburg ⟨URL: http://www.uni-hamburg.de/fachbereiche-einrichtungen/fb03/ihm/d11.pdf⟩ – visited on 18.05.2011.

SCHNETTLER, B., VINUELA, J. AND SEPULVEDAA, N. (2008): Attitude and Willingness to Pay for National and Store Brands of Milk in the South of Chile. In: Journal of Food Products Marketing, 14:4, 76–94.

SCHOLL, A., MANTHEY, L., HELM, R. AND STEINER, M. (2005): Solving multiattribute design problems with analytic hierarchy process and conjoint analysis: An empirical comparison. In: European Journal of Operational Research, 164, 760–777.

SCHWAN, P. (2009): Der informierte Verbraucher? Wiesbaden: VS Verlag für Sozialwissenschaften.

SCHWEIGER, G., HÄUBL, G. AND FRIEDERES, G. (1999): Consumers' Evaluations of Products Labelled "Made in Europe". In: Cases in Consumer Behaviour. Chichester [u.a.]: Wiley.

SOLOMON, M., BAMOSSY, G. AND ASKEGARD, S. (2001): Konsumentenverhalten - Der europäische Markt. München: Pearson Studium.

STOCKMEYER, B. AND WEINDLMAIER, H. (1999): Produktentwicklung in der Ernährungsindustrie - Ausgestaltung und Erfolg. Weihenstephan: Forschungszentrum für Milch und Lebensmittel Weihenstephan, TU München – Technical report ⟨URL: http://www.wzw.tu-muenchen.de/blm/bwl/publikationen/foodinn2.pdf⟩.

STRECKER, O., REICHERT, J. AND POTTEBAUM, P. (1976): Marketing für Lebensmittel: Grundlagen und praktische Entscheidungen. Frankfurt/Main: DLG-Verlag.

STREET, D.J., LOUVIERE, J.J. AND BURGESS, L. (2005): Quick and easy choice sets: Constructing optimal and nearly optimal stated choice experiments. In: International Journal of Research in Marketing, 22, 459Ð–470.

SWINK, M., TALLURI, S. AND PANDEJPONG, T. (2006): Faster, better, cheaper: A study of NPD project efficiency and performance tradeoffs. In: Journal of Operations Management, 24, 542–562.

THEUERKAUF, I. (1989): Kundennutzenmessung mit Conjoint. In: Zeitschrift für Betriebswirtschaft (ZfB), 59. Jg., Nr. 11, 1179–1192.

TOMLINSON, R. (1981): Some dangerous miconceptions concerning operational research and applied systems analysis. In: European Journal of Operational Reserach, 7(2), 203–212.

TRAIN, K.E. (2009): Discrete Choice Methods with Simulation. 2nd edition. New York: Cambridge University Press.

TRIJP, H., VAN (1995): Variety–Seeking in product choice behavior: Theory with applications in the food domain. Diss. Landbouw University, Wageningen.

TROMMSDORFF, V. (1993): Konsumentenverhalten 2. überarbeitete Auflage. Stuttgart: W. Kohlhammer.

TSCHEULIN, D. K. (1991): Ein empirischer Vergleich der Eignung von Conjoint-Analyse und "Analytic Hierarchy Process" (AHP) zur Neuproduktplanung. In: Zeitschrift für Betriebswirtschaft (ZfB), 61. Jahrgang, Nr. 11, 1267–1280.

TSCHEULIN, D.K. AND BLAIMONT, C. (1993): Die Abhängigkeit der Prognosegüte von Conjoint-Studien von demographischen Probanden-Charakteristika. In: Zeitschrift für Betriebswirtschaft (ZfB), 63. Jahrgang, Nr. 8, 839–847.

UNIVERSITÄT FÜR BODENKULTUR (2009): BOKU Entwicklungsplan 2009. Wien ⟨URL: http://www.boku.at/\-fileadmin/_/mitteilungsblatt/\-MB_2009_10/MB02/\-20090916_Endversion.pdf⟩ – visited on 31.05.2011.

UNIVERSITÄT FÜR BODENKULTUR (2011): Studierendenstatistik. Wien ⟨URL: https://online.boku.ac.at/BOKUonline/Studierendenstatistik.html?pAuswertung=7&pSJ=1701&pSemester=W&pGruppierung=2⟩ – visited on 15.05.2011.

VAIDYA, O.S. AND KUMAR, S. (2006): Analytic hierarchy process: An overview of applications. In: European Journal of Operational Research, 169, 1–29.

VRIENS, M., LOOSSCHILDER, G.H., ROSENBERGEN, E. AND WITTINK, D.R. (1998): Verbal versus Realistic Pictorial Representations in Conjoint Analysis with Design Attributes. In: Journal of Product Innovation Management, 15, 455–467.

WEBER, K. (1993): Mehrkriterielle Entscheidungen. München/Wien: Oldenbourg Verlag.

WINKELMANN, P. (2010): Marketing und Vertrieb - Fundamente für die Marktorientierte Unternehmensführung, 7. Auflage. München: Oldenbourg Wissenschaftsverlag GmbH.

WITTINK, D., VRIENS, M. AND BURHENNE, W. (1992): Commercial Use of Conjoint Analysis in Europe: Results and Critical Reflections. Utah ⟨URL: http://www.sawtoothsoftware.com/download/techpap/caeurope.pdf⟩ – visited on 15.05.2011.

ZAHEDI, F. (1986): The Analytic Hierarchy Process - A Survey of the Method and its Applications. In: Interfaces, 16, Nr. 4, 96–108.

Appendix

Table 17: Pre-Inquiry among the focused research group

Attribute	No. of votes
Labelled "Organic"	17
Expiry date / Shelf life	16
Fat content	12
Origin	11
Price	10
Packaging / Design	9
Brand	4
Treatment	4

The value for origin was summarized from 8 votes saying "Austria" and "Region" mentioned 3 times. Those interviews were carried out in the end of November, 2011. One third of the interviews, each, was done on following places of the BOKU campus (total n=30):

1. Exnerhaus
2. Mendelhaus
3. Muthgasse

The store–check was done in four different food selling shops in Vienna in summer/autumn 2011.

Table 18: Store check

Store	Fat contents	Shelf life	Label information	Price range
BILLA, Hofer, Merkur, Spar	two groups: [0.9–1.8]% = 1.5% [3.5–3.8]% = 3.5%	short: expiry date around 5 days, and longer: 14 days until expiry	non-GMO, region or district, AMA, national flag of Austria, water saving production, carbon foot print organic label	[0.85–1.19] Euro

Table 19: Optimal choice design for two 2/4-level attributes

	Product 1				**Product 2**				**Product 3**			
Set No.	A_1	A_2	A_3	A_4	A_1	A_2	A_3	A_4	A_1	A_2	A_3	A_4
1	0	0	0	0	1	1	1	1	0	1	2	2
2	0	1	0	2	1	0	1	3	0	0	2	0
3	1	0	2	0	0	1	3	1	1	1	0	2
4	1	1	2	2	0	0	3	3	1	0	0	0
5	1	1	0	3	0	0	1	0	1	0	2	1
6	1	0	0	1	0	1	1	2	1	1	2	3
7	0	1	2	3	1	0	3	0	0	0	0	1
8	0	0	2	1	1	1	3	2	0	1	0	3
9	1	1	3	0	0	0	0	1	1	0	1	2
10	1	0	3	2	0	1	0	3	1	1	1	0
11	0	1	1	0	1	0	2	1	0	0	3	2
12	0	0	1	2	1	1	2	3	0	1	3	0
13	0	0	3	3	1	1	0	0	0	1	1	1
14	0	1	3	1	1	0	0	2	0	0	1	3
15	1	0	1	3	0	1	2	0	1	1	3	1
16	1	1	1	1	0	0	2	2	1	0	3	3

This design was developed by STREET et al. (2005, 465), for other combinations – e.g. when collapsing one alternative with four into three levels is required – the work of ADDELMAN (1962) could be helpful. At the beginning of the results, choice set 1 is shown.

Figure 10: Hierarchy of the product fresh milk