DELI: An Interactive New Product Development and Targeting Tool

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Abstract

In this contribution, we present, DELI, a new interactive tool for supporting new product development decisions. In contrast to existing market research methodologies such as conjoint analysis, our approach is able to cope with a large number of potential product features and levels. It's main advantages lie in the integration of segmentation, visualization of competitive structures, the segment specific identification of new product functionality and several interactive features which support the search for new products. Furthermore, we introduce a novel conditional segmentation, mapping and positioning approach for an improved representation of products and customers within one map, supporting interpretation and segment specific new product development. An individual level scoring model supports the evaluation of new products.

1. Introduction

In early phases of new product development, management faces the challenge to select from a wide variety of potential feature attributes or product benefits to be included in a new product concept. In order to extract the right features, market research, in particular conjoint analysis, is used to measure customers preferences. Conjoint analysis aims at identifying the most important attributes for customers in order to find (segment specific) optimal product configurations. Although there are several software solutions for conducting conjoint analyses and estimating parameters, these tools provide poor graphical support, focusing mainly on simulating shares of preference for well-defined scenarios.

Adaptive conjoint analysis [4], one of the most often applied conjoint tools, allows to incorporate more attributes than other approaches (e.g., choice based conjoint analysis [9]). However, for designing the conjoint analysis, one has to collect knowledge about the most interesting benefits or new product features and customer requirements. When the number of attributes and levels is exhaustive, the required interview time and the number of interviews becomes prohibitive even for adaptive conjoint analysis. Therefore, a conjoint analysis often follows a more general market research study in which the relevant product attributes, benefits or shortcomings of existing products are identified. The approach presented in this paper aims at supporting this task. In this early development phase, new product developers are interested in questions of the following type:

- What are interesting new features or benefits for a new product?
- How do specific customer segments assess such new features?
- How well do existing products satisfy needs and wants in different segments?
- What are the most important attributes for a segment?
- Are there segments which are not (sufficiently) served with existing products?
- How do segment specific bundles of attributes or product functionality look like?

In addition, to achieve breakthrough innovations, NPD teams no longer can be limited to different marketing functions but now must include people with different business orientations (e.g., engineering, IT, finance, manufacturing) requiring to use tools that are intuitive and produce results that are easy to communicate. The advantage of the application of integrative tools for NPD has been demonstrated theoretically [6,10] and empirically [5]. In this paper, we present DELI, a new tool that combines multi-dimensional scaling (MDS) [1,3], customer segmentation and joint-space mapping to support the early product development phase. The main advantage lies in its intuitive graphical presentation, the possibility of using many potential product features and its support for the pre-prototype phase of new product development.

2. The DELI Approach

Lilien and Rangaswamy [7] propose a three step process for developing marketing strategies, consisting of segmentation, targeting and positioning (STP). The purpose of segmentation is to find an optimal number of homogenous market segments in terms of customer needs, wants, benefits sought, problem solutions desired, and

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usage situations and to describe these segments by variables (spending power, price sensitivity) which help the firm to understand how to serve these segments and how talk to these customers (media preferences, opinions, interests, etc.). The targeting step is concerned with the evaluation of segments (attractiveness, growth rate, distribution costs) and the selection of one or more target segments. Positioning aims at finding products and services that attract the targeted customers. Customer perceptions and preferences for a set of alternatives are typically presented on a map in Euclidean Space using multidimensional scaling methods. For practical application, this process should be extended by an evaluation step which triggers an interactive iterative development process. DELI builds on this extended STP approach supporting the graphical intuition of new product developers.

In accordance with the proposed STP process, in the first step, customers are segmented into homogeneous groups using the k-means clustering algorithm [8]. The optimal number of segments is determined using the Davies-Bouldin Index [2]. In the second step, an initial MDS solution is computed based on distances between product and attribute ratings/rankings. In the third step, customers are positioned in the map according to their individual preferences towards all assessed products and attributes. The customer position is calculated as a weighted average over all product and attribute positions using the importance customers place on them as weighting factors. A typical result of a consecutive application of clustering and MDS is shown in Figure 1. Since the MDS solution is not conditional on the segment solution derived in the first step, customer positions and segment memberships do not match. Since this joint presentation of products/attributes and customers prevents a segment specific interpretation and analysis, such a solution is hardly of any use for practical product development. Therefore, we replace this consecutive approach by a conditional segmentation, multidimensional scaling and customer positioning approach. In this new approach, the segment memberships influence the attribute and product positions in the map, which in turn determine the customer positions. In DELI, this process is iterated until convergence is achieved. Figure 2 demonstrates the improved outcome. It can be seen that the segment overlap is reduced considerably enabling direct interpretation and segment specific analysis of the market.

The approach is demonstrated using a market research survey in the telecommunication sector. The survey contains 738 interviews where customers are asked to provide ratings/rankings of existing products and concepts (TarifA, TarifB, ...), product attributes (base/fee/month, price/conventional/network, price/other/network, price/SMS/, price WAP, price/handset, price/own/net) as well as demographic (age, income, sex) and lifestyle (leisure preferences) data. Furthermore the respondents had to rate a wide variety of potential new benefits or applications. The aim of this study was to define new product concepts for different target groups and to evaluate these concepts' attractiveness.

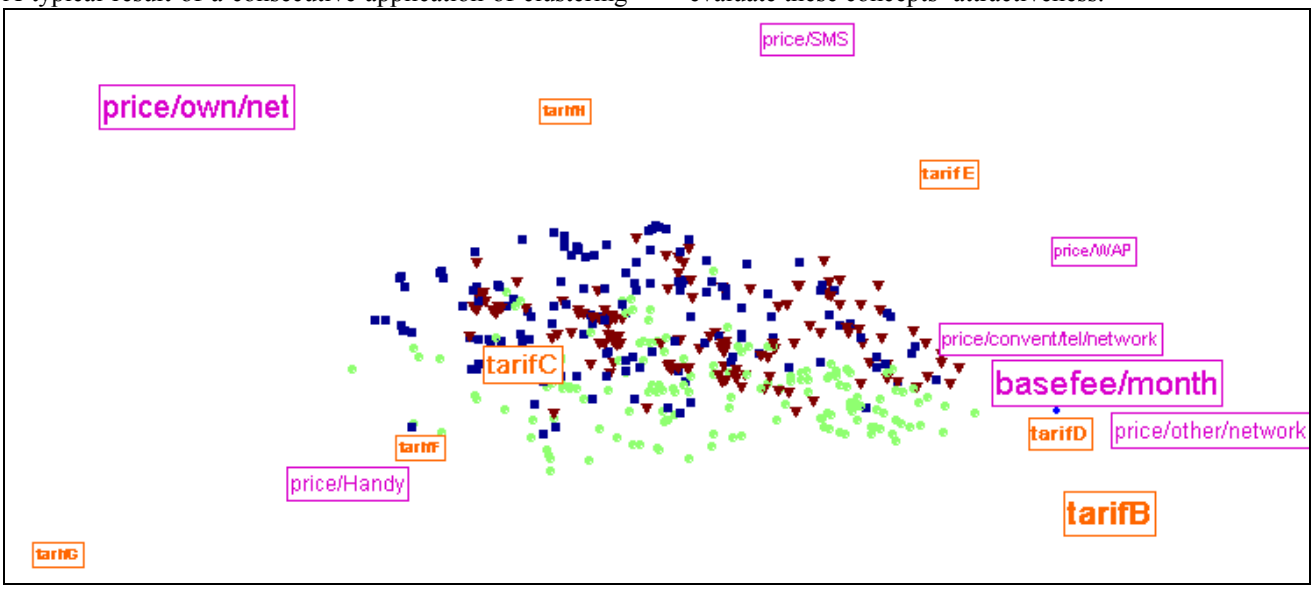

Figure 1: Map derived based via the step-wise approach

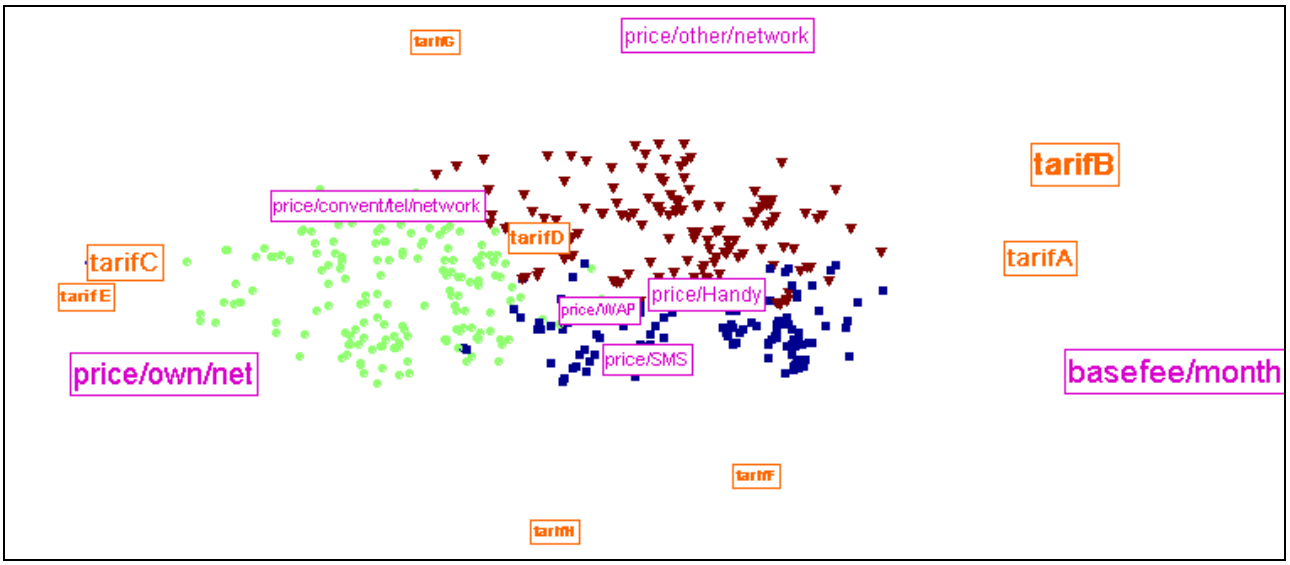

Figure 2: Conditional 2-dimensional map with attribute, product and customer positions.

Figure 2 demonstrates the application of the joint mapping of attributes/products and consumers: All products or product concepts (in orange color) are positioned according to their perceived difference. Similarly perceived products are positioned close to each other. The relative distance between products indicates the strength of competition. TarifA, e.g., is competing with TarifB, whereas TarifC competes with TarifE. The size of the product label indicates the overall attractiveness of a product, bigger size indicating higher attractiveness. For example, TarifB is preferred to TarifA by a majority.
Product attributes (label color is magenta) are positioned in the same way as products. Here, if two attributes are located close to each other, customers rate both attributes as important or both as unimportant indicating attribute bundles for new products. Products which are located close to an attribute indicate that for customers who prefer a certain product, nearby located attributes play an important role. The bigger the size of the attribute label, the higher this attributes' overall importance. For example, customers choosing TarifD judge the price for calling into a conventional network as important, whereas customers of TarifB focus on the monthly base fee. Every customer is displayed as a colored point in the map, the color indicating the segment to which the customer belongs. The lower the distance between a product and the customer position, the higher the preference towards this product. Accordingly, lower distances between customer position and attribute position indicate higher importance of the attribute for the customer, i.e., customers in segment 1 (brown colored triangles) prefer TarifA and TarifB whereas customers in segment 2 (green colored dots) have the highest preference for TarifC, TarifD and TarifE.

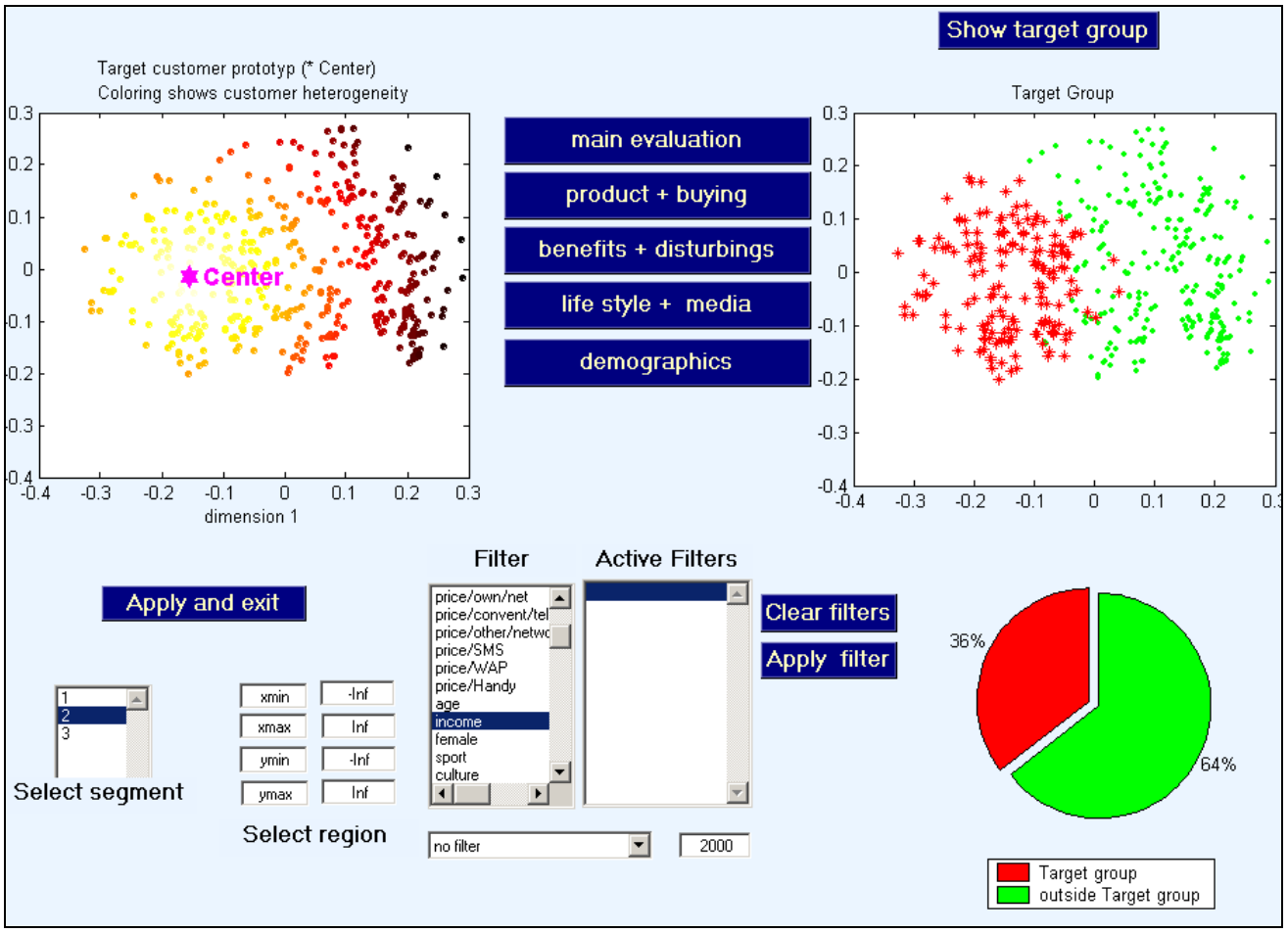

Figure 3: Selection of the target group and evaluations

Figure 3 shows the selection interface for the target group. The target group can be defined on the basis of segment membership, regional restrictions in the map, and any combination of filters of variables (e.g., income>2000). In our example, the target group is defined on the basis of the segment membership (segment 2). The pie chart indicates that 36% of the initial population belong to the target group. The scatter plot at the right hand side highlights (red dots) the selected customers. The plot at the left hand side shows the map including the product attributes and the center of all selected customers. The coloring of the individual customers indicates the heterogeneity of their preference towards a hypothetical customer prototype (the closer the customers are located to the center, the higher their similarity). The blue buttons in the center offer evaluations of the target group in terms of the most preferred products and attributes (shown in Figure 4), buying behavior, benefits and disturbing factors, lifestyle and demographics.

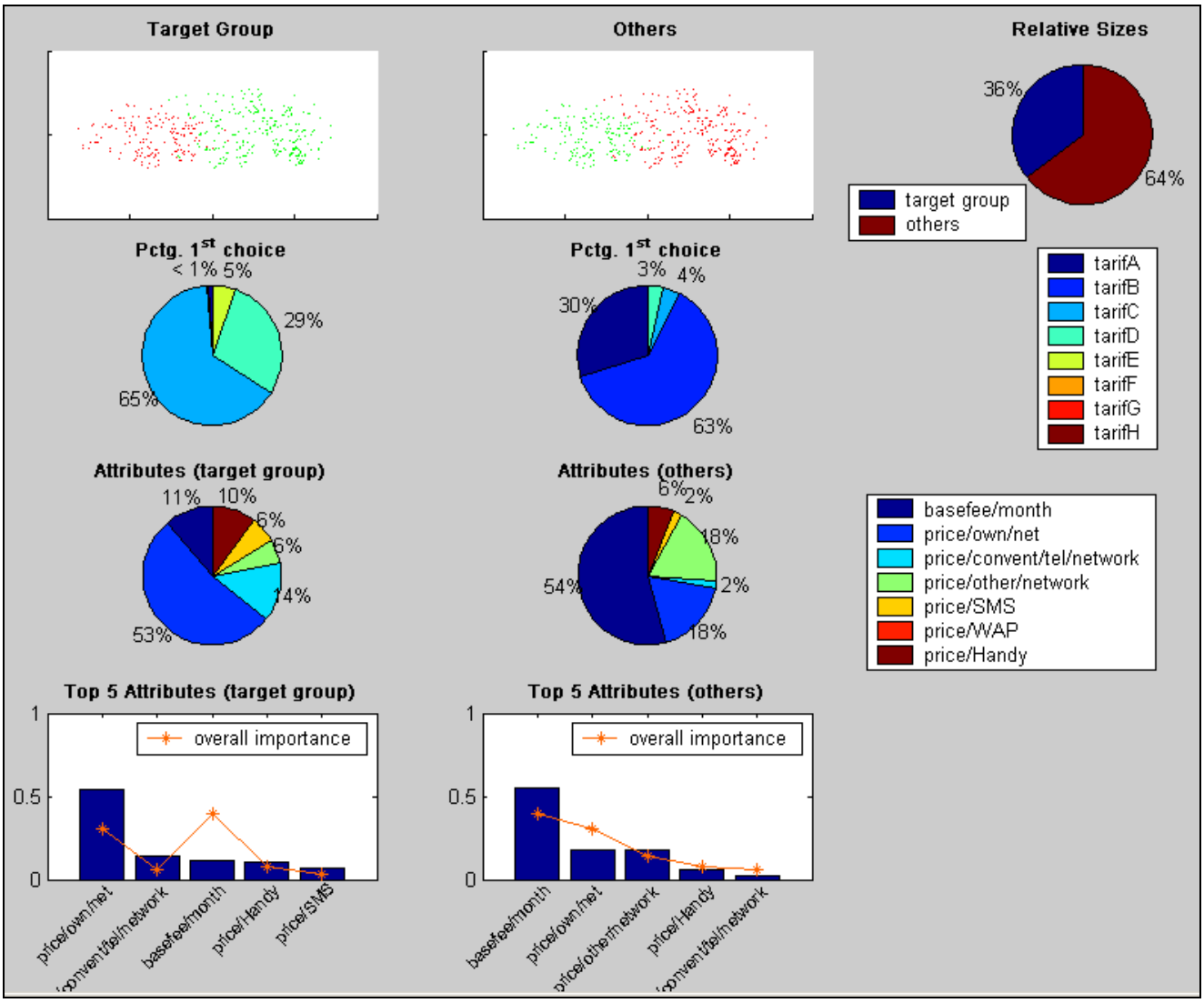

Figure 4: Analysis of the target group (segment 2) versus others. The Figure shows the selected customers on the map (red colored dots), the relative size of the selected target group, first preferences of products and attributes as well as the top 5 attributes.

As an example, we show the development of a new product concept for segment 2. Figure 4 gives an overview of the preference structure for the defined target group and compares it to customers outside the target group. It can be seen, that products TarifC, TarifD and TarifE are the most preferred products for this target group. The most important attributes for the target group are the *price into the own net*, the *base fee per month*, and the *price into the conventional network.* While *price into the own net* and *price into the conventional network* are typical order winners for segment 2, *base fee per month* plays a dominant role for all segments (see Figure 2). A new product for this target group should be defined in accordance with the attribute importance shown in Figure 4. In the next step, we describe how products or new concepts are evaluated.

Due to the typically very high number of potential benefits and attributes in the case of a new market entry, we recommend the use of an individual level scoring model for the evaluation of products. The score for customer i on product j is determined by the importance customer i places on attribute k, $w_{i,k}$, and the relative attractiveness of the chosen level of attribute k and product j:

$$y_{i,j} = \sum_k w_{i,k} x_{j,k}$$

The importance weights for all attributes can directly be derived from the questionnaire. In the case of rankings, the data are transformed into preferences. The relative attractiveness $x_{j,k}$ of an attribute level, $v_{j,k}$, depends on the range of the feature levels of all existing products or concepts in the following way:

$$x_{j,k} = \frac{v_{j,k} - \min_{l=1}^{J}(v_l)}{\max_{l=1}^{J}(v_l) - \min_{l=1}^{J}(v_l)}$$

In the case of decreasing utility with increasing levels (e.g., price), $x_{j,k}$ is re-scaled by $x_{j,k} = 1-x_{j,k}$. Thus, in this vector model, the score of a product is always dependent on the weights customers place on the individually assessed attributes and the relative attractiveness of the product levels.

The average importance of each attribute for the targeted group serves as an indicator for order winning product features (orange colored line in Figure 5). The overall attractiveness of a product for a target group is determined on the basis of the maximum score the consumers place on the defined products. Using the maximum score instead of an average score supports the creation of order winning products. The aggregation of the maximum scores over all customers in the target group serves as an indicator of the products' attractiveness (pie chart). For our example, it can be seen that 56% of the customers in the target group attach the highest score to the new product (*NewTarif*).

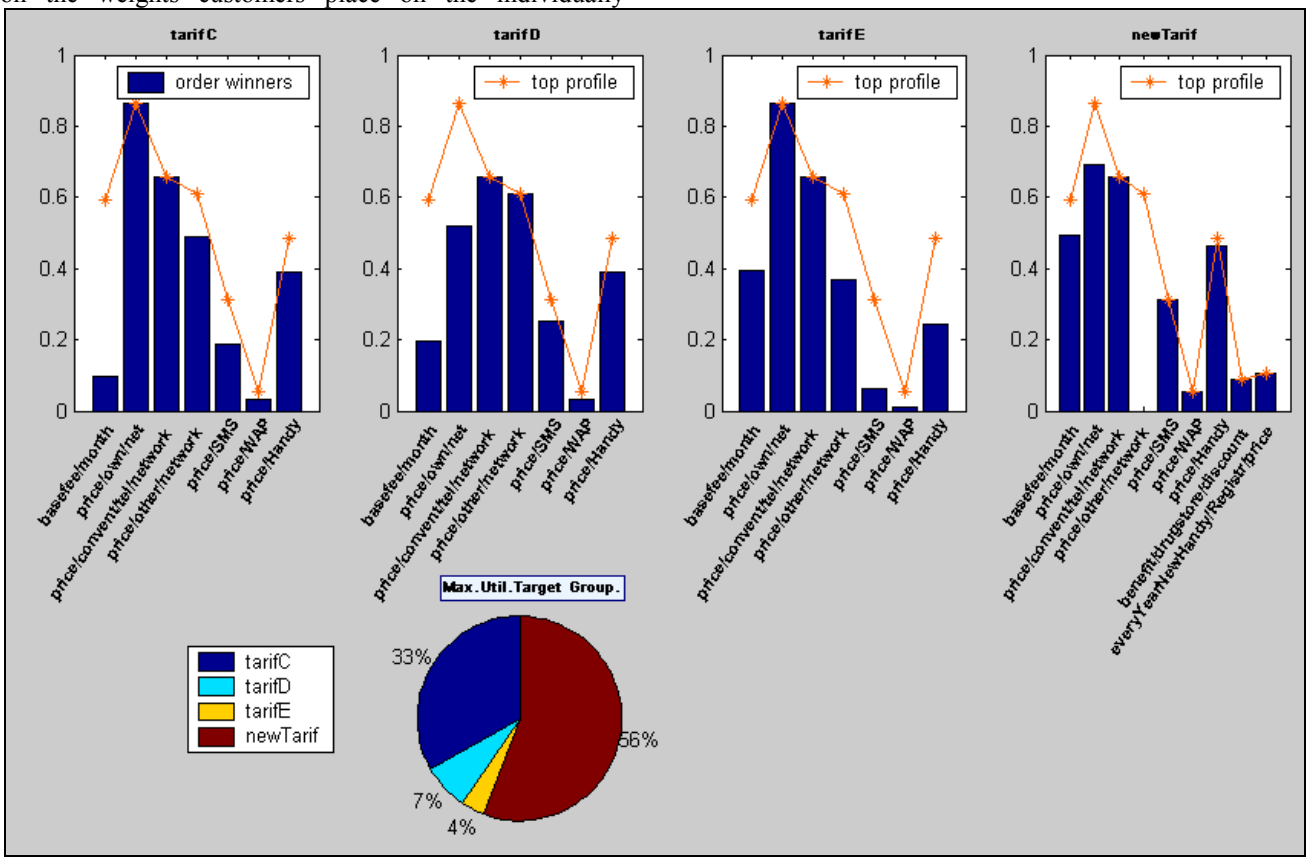

Figure 5: Bar charts for each product indicating order winning attributes. The (orange colored) line shows the maximum impact of each feature according to the preferences of the defined target group.

When the development team has found a satisfying set of concepts for the relevant target groups, these concepts can serve as a valuable input for a subsequent (prototype supported) conjoint analysis. Since our approach helps to identify the most relevant product features and target group characteristics, the results of the conjoint analysis will deliver more accurate and reliable results with reduced interviewing effort due to the reduced number of parameters to be estimated.

3. Summary and Conclusion

We have presented DELI, an interactive tool that assists new product managers in early phases of market analysis. DELI uses a market survey as input where customers rate or rank products and features. In contrast

to standard market research methodologies such as conjoint analysis, our approach is able to cope with a large number of potential product features and levels. It's main advantages lie in the integration of segmentation, visualization, new product definition and market simulation. Based on an integrated view of products, attributes and customers, new product managers are able to learn about competition, feature bundles and segment structure. This view supports the definition of the target group and the identification of potentially interesting features to focus on. We have introduced a novel conditional segmentation, mapping and positioning approach for an improved representation of products and customers within one map, supporting interpretation and segment specific new product development. The market simulation builds on a individual level scoring model and calculates product attractiveness using the maximum score per individual.

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