ABSTRACT

In today's highly competitive environment, where sources of product and process-based competitive advantage are quickly imitated by competitors, it is becoming increasingly difficult to differentiate on technical features and quality alone. Companies may overcome this problem by incorporating the ‘voice of the customer’ into the design of new products and focusing on customer value, thereby offering total solutions to customer needs. Therefore, it is critical for all technology-based companies to gain an accurate understanding of the potential value of their offerings, and to learn how this value can be further enhanced.

An important tool to elicit customer value at an early stage of the product development is the conjoint analysis. Conjoint analysis is a research technique for measuring customers' preferences, and it is a method for simulating how customers might react to changes in current products or to new products introduced into an existing competitive market. The paper will show how conjoint analysis can be used to bridge the information gap between the company and its customers, by confronting the value the company intends to offer with the value desired by its customers.

Key words: Customer value, conjoint analysis, preferences, product development.

INTRODUCTION

In today's highly competitive business environment, companies are forced to manage their activities primary to meet customers' needs and expectations and provide excellent service to the customer, while at the same time keep their profitability and competitiveness. However, to achieve their strategic goals companies must go further than achieve mere customer satisfaction: they must do much better than their competition. Many companies claim that they are customer-driven or focused. They often support this claim with evidence from extensive research studies. Even though, for every successful new product launch, there are endless failures. Such mistakes are often attributed to a failure to understand customer needs. However, the real problem is much more specific; it is a failure to understand the right customer needs and desires.

For understanding customer needs and studying them systematically it is necessary to be acquainted with the concept of creating value to the customer. Walters and Lancaster (1999) have stated that value is created by any product or service attribute, which motivates the customer to buy the product and takes him closer to achieving his goals. Although customers wish all their needs would be satisfied at once, it is company’s objective to understand which needs are most important for the customer. This understanding enables a company to use its scarce resources in an optimal way, thus creating the most value for the customer. Clearly company has to make tradeoffs in the performance levels of attributes which are related to each other. Therefore, it is critical for companies, especially those technology-
based, to gain an accurate understanding of the potential value of their offerings and to learn how this value can be further enhanced (Parasuraman, 1997; Woodruff, 1997). Accordingly, the clear estimation of the value a product or service might offer to the customer has become a topic of growing interest in the field of industrial marketing.

An important tool to elicit customer value at an early stage of product development is the conjoint analysis. Conjoint analysis means constructing and conducting particular experiments among customers in order to model their decision making process. As the name suggests, potential customers are asked to make judgments about the attributes that affect their purchase decisions conjointly, rather than evaluate each attribute individually. Analysis allows finding out which product attributes create most value to a customer and how customers are likely to react to different product configurations. This information can lead to the creation of optimal value offers. The aim of this paper is to analyze the applicability of conjoint analysis for closing the information gap between the company and its customers, by confronting the value the company intends to offer to its customers with the value desired by them.

THE CUSTOMER VALUE CONCEPT

Basically, the customer value concept assesses the value a product offers to a customer, taking all its tangible and intangible features into account. Most authors agree that it concerns to a trade-off between the benefits the product offers to the customer, and the sacrifices a customer has to make to obtain it (e.g. Gale, 1994; Griffin & Hauser, 1993; Best, 2000). Specifically, customer sacrifices are the overall monetary and non-monetary costs, for example time, energy and effort, the customer invests in order to get the product or service, or to maintain the relationship with the company. Benefits can be affected by a variety of factors: product quality, customer service quality and experience based quality. Additionally it is also often pointed out that brand can create value to customers. Therefore, a customer $i$ will choose among the available alternatives that product $j$ with the highest Benefits/Costs ratio:

$$ \max_j \frac{\sum_{i=1}^{n} U_{ji}}{\sum_{i=1}^{n} P_{ji}} $$

where $P_{ji}, i = 1,...,n$, is a bundle of costs (sacrifices) which customer $i$ has to make to obtain product $j$, while $U_{ji}$ is a bundle of benefits received from product $j$. This ratio may differ considerably among customers because of the differences in their individual situation. For example, a car manufacturer may deliver a sensor system for parking assistance, a feature that might be embraced by people who live in crowded cities, while people who live in the country might not perceive this as added value because they have enough parking space.

A number of authors have linked achieving higher customer value to higher profitability for the company (e.g. Day and Wensley, 1988; Best, 2000). However, it should be noted that just bringing a product to the market with a high potential customer value is no guarantee for a high market share or profits per se, because the customer's purchase decision is based on a choice between the competing offers in the market place. The attractiveness of an individual product offer should always be measured relative to competing products.

Although the conceptual importance of customer value is increasingly recognized in the marketing literature, its application in real-life industrial market studies lags behind, merely because the concept implementation still poses difficulties to the market researcher. One of the problems is that customer value can be defined at different abstraction levels (Brown, 1997; Kim, 1997; MacMillan & McGrath, 1996), and consequently, has to be measured at these different levels (Flint et al., 1997; Parasuraman, 1997). Basically, two abstraction levels of customer value can be distinguished. The first-order level consists of the trade-off between the perceived benefits and the sacrifices of a product as perceived by the customers at the purchasing decision. The second-order level consists of the benefits customers seek to fulfill their goals. This is the level at which customers think about their needs before the purchase. The
problem is that especially for new products, these goals and desires at second order level are often vague and therefore difficult to assess for the market researcher.

The Customer Value Model

The Customer value model, presented in Figure 1, shows the product development process from vague idea to market offer both from the company’s and the customer’s perspective. The model is based on the SERVQUAL model developed by Parasuraman et al. (1988) to assess the customer satisfaction of service offerings.

At the start of the product development process, the company may have only vague ideas about the value it intends to offer to its customers. This value depends on the company’s perceptions of what the customer wants, and is based on its strategy, capabilities and resources. In the model, it is marked as the intended value map of the company. Through market research, the company will try to match its intended value map with the preferences and desires of the future users (desired value map) to create a product that fulfils the customer needs. The term value map is used here, since the customer value of a product or service can best be described as a bundle of values, being the aggregation of its benefits and sacrifices. An information gap may occur between these two maps. This gap reflects a situation in which the company has insufficient information about what the customer desires. Due to restraints in the company’s strategy and/or marketing capabilities, the company may focus on the ‘wrong’ customer needs.

The value of the product as created by the company and introduced to the marketplace is called the delivered value map. The delivered value may differ from the intended value because of technical constrains and/or miscommunication between marketing and product development departments. This will result in the design gap.

Customers base their expectations of the product’s performance on what they perceive. This expectation is called the expected value map in the model. This map may differ from the desired value map because there might not be any product on the market that exactly matches the customers’ desires. Therefore, customers have to choose that product that best matches their expectations. In other words, they have to make a compromise between the value they perceive in the marketplace and the value they would desire. The smaller this compromise gap, the higher the chance that the company is successful in winning customers. The perception gap reflects the potential mismatch between the value delivered by the company, and the customers’ perception of this value. How potentially advantageous a product offer might be for customers, if they do not recognize this at the purchasing decision, it is of no use to the company. A company can try to reduce this gap by making certain intangibles more tangible via corporate communication. After the purchase and usage, customers will evaluate the value they have received. The outcome of this evaluation is called the received value map in our model. The satisfaction gap reflects the gap between the expected and the received value.
CONJOINT analysis

Conjoint analysis is an experimental approach for measuring customers’ preferences about the attributes of a product or service. Originally developed by psychologist Luce and statistician Tukey (1964) in the field of mathematical psychology, conjoint analysis has, since the mid-70’s, attracted considerable attention especially in marketing research, as a method that portrays customers’ decisions.

The way of the conjoint analysis application could be simply explained as follows. Researchers at first develop a set of alternative products (real or hypothetical) in terms of bundles of quantitative and qualitative attributes through fractional factorial designs. These real or hypothetical products, referred to as profiles (see Figure 2), are then presented to the customers during the survey.

![Figure 2: Relations between the profile, attributes and the attribute levels](image)

The customers are asked to rank order or rate these alternatives, or choose the best one. Because the products are represented in terms of bundles of attributes at mixed “good” and “bad” levels, the customers have to evaluate the total utility from all of the attribute levels simultaneously to make their judgements. Based on these judgements, the researchers can estimate the partial-worths for the attribute levels by assuming certain composition rules. The roles explain the structure of customer’s individual preferences. The manner that respondents combine the part-worths of attribute levels in total utility of product can be explained by these roles. The simplest and most commonly used model is the linear additive model. This model assumes that the overall utility derived from any combination of attributes of a given good or service is obtained from the sum of the separate part-worths of the attributes. Thus, respondent $i$’s predicted conjoint utility for profile $j$ can be specified as follows:

$$U_{ij} = \sum_{k=1}^{K} \sum_{l=1}^{L_k} \beta_{ikl} x_{ijkl} + \varepsilon_{ij}, \quad i = 1, \ldots, I; \quad j = 1, \ldots, J,$$

where $I$ is the number of respondents $(i = 1, \ldots, I)$; $J$ is the number of profiles $(j = 1, \ldots, J)$; $K$ is the number of attributes $(k = 1, \ldots, K)$; $L_k$ is the number of levels of attribute $k$ $(l = 1, \ldots, L_k)$. $\beta_{ikl}$ is respondent $i$’s utility with respect to level $l$ of attribute $k$. $x_{ijkl}$ is such a (0,1) variable that it equals 1 if profile $j$ has attribute $k$ at level $l$, otherwise it equals 0. $\varepsilon_{ij}$ is a stochastic error term.

The parameters $\beta_{ikl}$ are estimated by a regression analysis. These beta coefficients, also known as part-worth utilities, can be used to establish a number of things. Firstly, the value of these coefficients indicates the amount of any effect that an attribute has on overall utility – the larger the coefficient, the greater the impact. Secondly, the ratio of the coefficients shows how much of one attribute an individual would be willing to give up, in order to get more of another attribute. Thirdly, part-worths can be used to calculate the relative importance of each attribute, which is known as an importance score or value. These values are calculated by taking the utility range for each attribute separately, and then dividing it by the sum of the utility ranges for all of the factors.
Given that part worth utilities are calculated at the individual level, if preference heterogeneity is present, the researcher can find it. Therefore, part-worths can be used for preference-based segmentation. Respondents who place similar value to the various attribute levels will be grouped together into a segment. Segmentation of conjoint part-worths produces true “benefit segments”. This is something that is sometimes difficult to do using other survey instruments, because respondents have difficulty stating what benefits they actually value the most.

Overall utility scores can be estimated for different combinations of attributes by inserting the appropriate levels into Eq. 2. These utility scores can be further used to predict the market shares for each of the defined combinations. For that purpose, a model that uses exponential transformation, also known as the logit model, can be used: A logit model represents the probability that customer $i$ will choose the $j$th profile from a set of $m$ exiting profiles on the market. The logit model is expressed as:

$$P_{ij} = \frac{e^{bU_{ij}}}{\sum_{j=1}^{m} e^{bU_{ij}}}, \quad i = 1, \ldots, I, \quad j = 1, \ldots, J .$$

(3)

The exponent $b$ is used to fine-tune the results so that they reflect the current customer behavior on the market more accurately. However, the real power of conjoint analysis is the ability to both predict preferences for profiles that weren't rated by the respondents, and to perform a what-if analysis. This can be done using market simulation models.

It can be summarized that in the product development process, conjoint analysis can be used for multiple purposes (see Figure 3):

- To determine the contributions of attribute levels and their respective values (part-worths) to customer overall preferences;
- To establish a valid model of customer judgments useful in predicting the customer acceptance of any combination of attributes for existing product or product newly introduced to market;
- To define product with optimal combination of attributes (desired value map);
- To determine the sensitivity of the customer's preference to the attribute level changes:
- To predict market share for products with different combination of attributes.

The advantage of conjoint analysis compared to other methods is that it defines precisely the performance levels of studied product attributes, whereby ensuring that respondents and researchers understand the research question more clearly. The situation faced by respondents is very similar to their actual purchasing situation. Namely, evaluating the profiles (product concepts) is analogous to evaluating the products in the real market. Furthermore, conjoint analysis allows measuring and analysis of consumer preferences even for individual respondents, thereby enabling the segmentation and clustering of customers. An additional advantage is that a conjoint analysis can be conducted on small samples, which is particular useful in business-to-business settings that are characterized by a relatively small sample size.
CONCLUSION

This paper provides insight into how companies can examine customer value in a highly competitive business environment. By assessing the desired value map of their customers using conjoint analysis, a company can acquire a benchmark for its intended value. This way a company can guide and improve its product development activities before market introduction, using the analysis to optimize the delivered value of its products, and to focus its corporate communication on those value areas which are perceived as most important by its customers. The customer value model presented in this paper describes how customers choose between products to try to achieve their higher order goals, and how a company should base its value strategy on this.

Although the conjoint analysis is often mentioned in marketing literature, it is not so often used in industrial marketing practice. However, conjoint analysis is a method that can help in product development decisions, because it enables to estimate the value created to customers with remarkable accuracy. The results of conjoint analysis give a good picture about the importance of different product attributes in creating value for customers. Using this information, it is possible to develop optimal product configurations. Models based on the results of conjoint analysis allow predicting the response of the market to changes in existing product configurations or price before the actual decision is made.

REFERENCES

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