

A STUDY ON VOC APP

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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. There are many tools that help translate the Voice of the customer, to the Voice of the designer, but it is important to choose the right tool and in the correct sequence, for a successful product development. 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 discusses, how the 'hardware' features and the 'software' features, from a customer's point of view, need to be translated into product features and also, the sequencing of the tools, to achieve a perfect drill-down into conjoint analysis, which is an ultimate tool to help translate the Voice of the customer.

Key Words: Conjoint analysis, Kano analysis, Pugh Matrix, New Product Development, Quality Function Deployment, Voice of Customer.

I. INTRODUCTION

Companies must develop new products to grow and stay competitive, but innovation is risky and costly. A great majority of new products never makes it to the market and those new products that enter the market place, face very high failure rates. Exact figures are hard to find and vary depending on the type of market (industrial versus consumer) and product (high tech versus fast moving consumer goods). Moreover, different criteria for the definition of success and failure make it complicated to compare. However, failure rates have remained high, averaging 40% (Griffin, 1997). According to (Crawford, 1987), the average failure rate is about 35%. Later, (Cooper, 1994), a leading researcher in the field of new product development (NPD), estimates a failure rate in the order of 25-45%. Since the 1990s it became apparent that the high failure rates of new products justified research to examine the reasons for success and

failure. Later on it became clear that many other factors are also very appropriate NPD practices, which can lead to product marketplace success. Success depends, among other factors, on the degree to which the new product successfully addresses identified consumer needs and at the same time excels competitive products. Unfortunately, although past research on NPD performance has shown that even the slightest improvements in an organisation's NPD process could yield significant savings (Montoya-Weiss and O'Driscoll, 2000), bringing successful new products to the market is still a major problem for many companies. Despite increasing attention to NPD, the new product success rate has improved minimally (Wind and Mahajan, 1997). (Cooper, 1999) states: 'Recent studies reveal that the art of product development has not improved all that much- that the voice of the customer is still missing, that solid up-front homework is not done, that many products enter the development phase lacking clear definition, and so on.

The key learning emerging from NPD performance analysis is that success is primarily determined by a unique and superior product and that the achievement of that is primarily driven by the effective marketing-R&D interfacing at the very early stages of the NPD process (opportunity identification). Hence, the paradox here is that while failure reasons (at strategy, process and product level) are quite well understood and documented, still a high proportion of new products fails. One reason for this may be that factors of success and failure have not been translated into meaningful guides for action. Consequently, companies still have problems with effectively and efficiently implementing the factors of success into NPD practice. Consumer research at the earliest stages of NPD that helps bridge marketing and R&D functions is crucial in this process. (Miller and Swaddling, 2002) argue that the shortcomings in the current state of NPD practice can be directly or indirectly tied with consumer research done in conjunction with NPD. As this appears a major bottleneck, this paper looks at the probable reasons for not embracing the 'mantra' of consumer research for the New product development and discusses the selection and application of the VOC tools to translate the customer's voice to product attribute and features for a successful product development.

II. LITERATURE SURVEY

New product development encompasses a wide variety of aspects from concept to reality. According to (Rosenau, 1996), a new product development (NPD) process defines and describes the means by which a company or organization can convert new ideas and innovative concepts into marketable product or services. The NPD process can broadly be divided into four phases, namely, (1) concept exploration; (2) design and development; (3) manufacturing and assembly; and (4) product launch and support. (Calantone and Benedetto, 1988) proposed an integrative model of the new product development process, which is based on technical and market factors for parallel implementation of the new product development process.

(Song and Montoya-Weiss, 1998), through research and literature review, identified the following six sets of general NPD activities: (1) Strategic planning for integration of product resource and market opportunities; (2) Idea generation and elaboration, and evaluation of the

potential solution; (3) Business analysis for converting new product idea into design attributes that fulfill customer needs and desires; (4) Manufacturing development for building the desired physical product; (5) Testing the product itself which includes all individual and integrated components; (6) Coordination, implementation, and monitoring of the new product launch.

Similarly, (Jones and Stevens, 1999) proposed the NPD process which forms market strategy points of view and mainly concerns the use of marketing techniques for generating the new product idea.

To design a product well, a design team needs to know what it is they are designing, and what the end-users will expect from it. Quality Function Deployment is a systematic approach to design based on a close awareness of customer desires, coupled with the integration of corporate functional groups. It consists in translating customer desires into design characteristics for each stage of the product development (Rosenthal,1992). Ultimately the goal of QFD is to translate often subjective quality criteria into objective ones that can be quantified and measured and which can then be used to design and manufacture the product. It is a complimentary method for determining how and where priorities are to be assigned in product development. The intent is to employ objective procedures in increasing detail throughout the development of the product (Reilly, 1999). Quality Function Deployment was developed by Yoji Akao in Japan in 1966. By 1972 the power of the approach had been well demonstrated at the Mitsubishi Heavy Industries Kobe Shipyard (Sullivan, 1986) and in 1978 the first book on the subject was published in Japanese and then later translated into English in 1994 (Mizuno and Akao,1994). Customer focused product development brought focus on the interpretation of the voice of customers and subsequently derivation of explicit requirements that can be understood by marketing and engineering (Jiao and Chen, 2006). In general, it involves three major issues, namely (1) understanding of customer preferences (2) requirement prioritization and (3) requirement classification. Among many approaches that address customer need analysis, the Kano model has been widely practiced in industries as a preferred tool of understanding customer preferences owing to its convenience in classifying customer needs based on survey data (Kano et al., 1984).

The Pugh Matrix is a type of Matrix Diagram (Burge, S.E 2006) that allows for the comparison of a number of design candidates leading ultimately to which best meets a set of criteria. It also permits a degree of qualitative optimisation of the alternative concepts through the generation of hybrid candidates. Fundamentally a Pugh Matrix can be used when there is a need to decide amongst various alternatives objectively.

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 is known for being a research technique by which one can investigate combinations of features to identify the predicted consumer preferences. (Green and Rao, 1971) drew upon the conjoint measurement theory, adapted it to the solution of marketing and product-development

problems, considered carefully the practical measurement issues, and initiated a flood of research opportunities and applications (Wittink and Cattin, 1989). Further developed and customized by Paul Green and his colleagues at Wharton School of the University of Pennsylvania (Green and Srinivasan, 1981, 1990), (Wind, Green, Shifflet and Scarborough, 1989) (Green and Krieger, 1991, 1996), conjoint analysis has evolved into a mainstay of the research profession. (Green and Srinivasan, 1990), (Green and Krieger, 1995) argue that conjoint analysis has multiple advantages in quantifying consumer preferences. It assumes that a product or service can be described as an aggregate of its conceptual components: attributes (also called variables, silos or categories) and elements (levels) (Krieger et al., 2004; Moskowitz et al., 2005). By presenting a series of concepts, which are combinations of elements from different attributes, to a number of respondents and finding out which are most preferred, conjoint analysis allows the determination of utilities of each of the elements called the individual utility scores (part-worth or impact scores) of elements (Kessels et al., 2008). Understanding precisely how people make decisions, producers can work out the optimum level of features and services that balance value to the customer against cost to the company. Conjoint analysis, sometimes called 'trade-off analysis', reveals how people make complex judgments. The technique is based on the assumption that complex decisions are made not based on a single factor, but on several factors Considered Jointly, hence the term Conjoint.

III. CONSUMER RESEARCH: PROBABLE REASONS FOR ITS DISUSE

1. Consumer research lacks credibility (Nijssen and Lieshout 1995) (Song, Neeley and Zhao, 1996)(Gupta, Raj and Wilemon, 1985; Moenaert and Souder, 1990)
2. Consumer research does not help to come up with innovative new product ideas (Ortt and Schoormans, 1993; Ottum and Moore, 1997)(Ulwick, 2002)(Wind and Lilien, 1993). (Ozer, 1999)(Burton and Patterson 1999) (Smith 2003)(Day, 1994)
3. Consumer research delays product development process (Miller and Swaddling, 2002).
4. Consumer research lacks comprehensibility (Moenaert and Souder, 1990). (Moenaert and Souder, 1996)(Dougherty 1990)
5. Consumer research lacks actionability for R&D (Moenaert and Souder, 1996; Madhavan and Grover, 1998)(Shocker and Srinivasan, 1979)(Gupta, Raj, Wilemon, 1985)(Bailetti and Litva, 1995)

IV. ATTRIBUTES OF EFFECTIVE CONSUMER RESEARCH

First, effective consumer research for opportunity identification must be comprehensive in that it provides a detailed insight into the relation between product characteristics and

consumers' need fulfillment and behaviour. Consumer research for NPD is often thought of as existing of historical purchase information or product evaluations. However, understanding consumer behaviour encompasses much more than just getting insight into how consumers evaluate and purchase products and services (Jacoby, 1979). (Sheth, Mittal and Newman 1999) define consumer behaviour as all mental and physical activities undertaken by consumers that result in decisions and actions to pay for, buy, and use products and services. For consumers to decide to buy a product they must be convinced that the product will satisfy some benefit, goal, or value that is important to them (Gutman, 1982; Walker and Olson,1991). To develop a superior new product, consumer research needs to identify consumer's product attribute perceptions, including the personal benefits and values that provide the underlying basis for interpreting and choosing products. As such, it makes a number of key considerations explicit. This provides a common basis for the different functional disciplines involved in the NPD process. In addition, it makes clear which crucial factors affect consumer perceptions, preferences and choices, and what trade-offs need to be applied in designing a product. This needs VOC (VOICE OF CUSTOMER) translation tools.

V. A FEW PROVEN VOCTOOLS

- QFD
- Pugh Matrix
- Kano
- Conjoint Analysis

The above are few proven tools that have proved their worth in product development. Here is a brief about each of them.

a) **QFD**: In Akao's words, QFD "is a method for developing a design quality aimed at satisfying the consumer and then translating the consumer's demand into design targets and major quality assurance points to be used throughout the production phase. ... [QFD] is a way to assure the design quality while the product is still in the design stage." As a very important side benefit he points out that, when appropriately applied, QFD has demonstrated the reduction of development time by one-half to one-third. (Akao, 1990)

The 3 main goals in implementing QFD are:

1. Prioritize spoken and unspoken customer wants and needs.
2. Translate these needs into technical characteristics and specifications.
3. Build and deliver a quality product or service by focusing everybody toward customer satisfaction.

b) **Pugh Matrix:** Pugh concept selection: There are many conventional screening methods, such as Technology Readiness Assessment (TRA), GO/NO-GO Screening (Ullman, 2003), etc., available for simple concept evaluation. However, for complex cases, Pugh Concept Selection method is generally used. This method is very effective for comparing concepts that are not well refined for direct comparison with the engineering requirements. Basically, it is an iterative evaluation that tests the completeness and understanding of requirements, followed by quick identification of the strongest concept. It is particularly effective if each member of the design team performs it independently. The results of the comparison will usually lead to repetition of the method, with iteration continued until the team reaches a consensus.

c) **Kano:** Analysis of customer need information is an important task. The advantages of classifying customer requirements by means of the Kano method are very clear priorities for product development. It is, for example, not very useful to invest in improving must-be requirements which are already at a satisfactory level but better to improve one-dimensional or attractive requirements as they have a greater influence on perceived product quality and consequently on the customer's level of satisfaction. Product requirements are better understood: if the product criteria which have the greatest influence on the customer's satisfaction can be identified. Classifying product requirements into must-be, one-dimensional and attractive dimensions can be used to focus on Kano's model of customer satisfaction can be optimally combined with quality function deployment and Pugh-matrix. A pre-requisite is identifying customer needs, their hierarchy and priorities (Griffin/Hauser, 1993). Kano's model is used to establish the importance of individual product features for the customer's satisfaction and thus it creates the optimal prerequisite for process-oriented product development activities. Kano's method provides valuable help in trade-off situations in the product development stage. If two product requirements cannot be met simultaneously due to technical or financial reasons, the criterion can be identified which has the greatest influence on customer satisfaction. Must-be, one-dimensional and attractive requirements differ, as a rule, in the utility expectations of different customer segments. From this starting point, customer-tailored solutions for special problems can be elaborated which guarantee an optimal level of satisfaction in the different customer segments. Discovering and fulfilling attractive requirements creates a wide range of possibilities for differentiation. A product which merely satisfies the must-be and one-dimensional requirements is perceived as average and therefore interchangeable (Hinterhuber, Aichner and Lobenwein, 1994).

d) **CONJOINT ANALYSIS:** Designing and Executing a Conjoint Study: In designing and executing a conjoint study, the researcher is faced with three steps that are unique to conjoint research:

- Selecting the appropriate type of conjoint
- Selecting the attributes and levels
- Developing and interpreting utilities

Selecting the Appropriate Type of Conjoint: In practice, trade-offs matrices are rarely

used, narrowing the choice to either ratings-based or choice-based methods. While researchers are divided on this topic, we typically recommend methods that allow respondents to make comparative judgments, such as paired-comparisons and choice-based conjoint.

We believe the choice between these two approaches depends on the point in the product development cycle. The earlier in the cycle, the more is the 'paired-comparison method' as the focus is on product-specific features. Later in the cycle, choice-based methods are more appropriate because many of the development priorities have been solved and the focus is more on the final product configuration, price and brand and competitive reaction.

Selecting Attributes and Levels: The single most important component of executing a conjoint study is selecting conjoint attributes and levels. In general, attributes describe product features. Conjoint analysis also frequently includes the attributes of price and brand. Many other attributes are possible though, including distribution channel, service or warranty options, product promotions, or positioning statements. The actual attributes used should also follow these guidelines:

1. The attributes must all influence real decisions. That is, the attributes must be determinant.
2. The attributes must be independent.
3. The attributes should measure only one dimension.

Levels must be chosen so that each product can be defined by only one of the levels. The levels should include a wide enough range to allow the current and future markets to be simulated, as well as a nearly equal number of levels for each attribute. In general, extrapolation of utilities to levels not included should be avoided. If, after including a complete range of levels, the researcher finds many unrealistic combinations of levels, the category definition needs to be revised or respondents need to be given customized conjoint studies. Conducting Preference Simulations Conjoint utilities are most frequently used in market simulators that are used to answer "what if" scenarios. After conducting a conjoint study and modeling the current market, a researcher might be interested in the effect of a possible product design change. These scenarios can be investigated in a market simulator. Simulations produce shares of preference that resemble—but are not the same as—market share. The researcher must make several decisions in conducting preference simulations. The first decision is which choice model to use.

There are basically two choice models in common use today: the first choice model and the probabilistic model. Each will be discussed in detail below. The discussion of these models is centered on individual level data.

First Choice Model: The first choice model is the more straightforward of the two models discussed. In the first choice model, the researcher sums the utility of each product configuration being simulated and, for each respondent, assumes that the respondent will buy

the product with the highest utility. The share of preference estimates, then, becomes the proportion of respondents for which each product had the maximum utility. While this initially seems reasonable, it might be too simplistic. Very minor differences in summed utilities can have a huge impact on predicted shares of preference.

Probabilistic Model: 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, are then presented to the customers during the survey. 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 judgments. Based on these judgments, the researchers can estimate the part-worth utilities for the attribute levels by assuming certain composition rules. The rules explain the structure of customer's individual preferences. The manner that respondents combine the part-worth's in total utility of product can be explained by these rules. 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-worth's of the attributes.

The following case study illustrates the use of a few of the above tools and the sequence of application, as the product development success, depends on the right attribute, filtered appropriately into the drawing board.

VII. CONCLUSION

Given the increasing intensity of business competition and the strong trend towards globalization, the attitude towards the customer is very important, their role has changed from that of a mere consumer to the role of co-designer, co-operator, co-producer, co-creator of value and co-developer of knowledge and competencies. Furthermore, the complex competitive environment in which companies operate has led to the increase in customer demand for superior value. While there are many tools, to capture the voice of the customer, there is none, having the caliber of CONJOINT ANALYSIS. This is due to the 'statistical' nature of the tool, which is objective and repeatable. In fact, as Conjoint Analysis is rooted deeply in statistics, there is no 'personal judgment' clouding the decision making process. It is pure mathematics. The input data, in the form of, correct attributes and their levels, is a prerequisite to performing a correct Conjoint Analysis. These inputs, needs to be scientifically filtered and presented into the conjoint function. The use of QFD, Pugh Matrix and Kano complements well with Conjoint Analysis, ensuring synthesis of strategically important customer value dimension and customer focused product design.

Using the QFD and Pugh Matrix to capture the 'engineering voice', coupled with 'Kano model' to capture the 'emotional voice', the total VOICE OF THE CUSTOMER, is captured. The results of the conjoint analysis give the appropriate consumer's voice in terms of different

product attributes that create value for the customers. Thus it enables to estimate the value created to customers with remarkable accuracy. It is also useful for market segmentation decisions and other improvements that create value for company. Furthermore, models based on conjoint data allow predicting the response of the market to changes in existing product concepts or price before the actual decision is made. Thus, with the above mentioned VOC tools and the recommended sequence (refer Figure 3) a complete and accurate translation of the VOC can be achieved, for a successful product development. Conjoint analysis is also very useful method in making optimal pricing and product decisions.

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