
CONJOINT ANALYSIS: A PERFECT LINK BETWEEN MARKETING AND PRODUCT DESIGN FUNCTIONS- A REVIEW

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ABSTRACT

New products that deliver added consumer value contribute significantly to the success of companies. In the numerous studies of new product performance over the years, consensus has developed that understanding consumer needs is of paramount strategic value, especially in the early stages of the product development process. During these early stages, the product has not yet been specified and the aim is to search for novel product ideas from a marketing and technological perspective. Industrial designers are increasingly challenged by the interdisciplinary nature, increasing complexity and time pressure in today's design projects. Understanding the product's environment, the user and incorporating all design aspects accurately places a great burden on the designer. The constant risk that the negligence of certain design aspects may result in inferior products, urges the need to use a systematic tool that would support the designer in creating useful, usable and satisfying products and also to assimilate and synthesize the Marketing function's VOC (Voice Of Customer) information. Traditional marketing thought and practice largely views new product development (NPD) as an internal firm-based activity in which customers are relatively passive buyers and user. This paradigm creates a 'gap' between the Marketing and Product Design functions. Conjoint Analysis technique, is an ideal tool, to bridge this 'divide' and help, develop customer focused, successful products.

INDEX TERMS: Conjoint analysis, Fuzzy-front end, New Product Development, Voice of Customer, VOC translation tools

I INTRODUCTION

In order to survive, firms must innovate and innovation usually means new products, new technology and new production techniques. But new technology is not sufficient for profitability. Profit comes from sales and sales come from products that fill consumer needs. (Utter back, 1974) in a review of studies spanning over 2000 products and 100 industries, indicated that 60-80%, of successful innovations come from identification of a consumer need.

Understanding market needs in order to design products that meet or exceed consumer expectations is one of the most critical tasks for developers of new products. In the last decade, the importance of listening carefully to the 'voice of the consumer' has become conventional wisdom (Slater and Narver, 2000; Garber, Hyatt and Starr, 2003). Over the years, many tools and techniques have been developed for use in the new product development process (Thomas and Chandrasekaran, 2013). Better and effective use of consumer intelligence obtained by appropriate methodologies is viewed as critical to being successful (Cooper, Elko J. Kleinschmidt 1994; Calantone, Schmidt and Song, 1996).

Recently, numerous new product development (NPD) performance studies have shown that aligning new products with consumer needs and differentiation from competitors is of crucial importance for success in the market place (Henard and Szymanski, 2001). One of the most important factors leading to new product success is providing a unique and superior product in the eyes of the consumer (Cooper, 1979; Cooper, Elko, J. Kleinschmidt, 1993). This has resulted in structured procedures that challenge new product ideas at their various stages of development against consumer judgment. The best known of these procedures is the stage-gate-process, consisting of a five-stage, five gate model in which new product ideas are developed and tested before a "go or no-go" decision is made at each of the subsequent gates (Cooper, 1990; O'Connor, 1998). The implementation of these structured processes to challenge and verify new product ideas against consumer assessment is identified as a key success factor in NPD. However, increasingly it is being recognised that the quality of the ideas entering the NPD process is at least equally important to NPD success as structured approaches (Wind and Mahajan, 1997). In fact, pre-development activities (i.e. those activities carried out before products enter the development stage) are among the most critical activities associated with success (Cooper, Elko J. Kleinschmidt 1988; Roozenburg and Eekels, 1995; Henard and Szymanski, 2001). In these pre-development activities, important and (partly) unfulfilled consumer needs are being identified as a source of new product ideas and these new product ideas are assessed on their feasibility and consumer appeal very early on, in the process.

Consumer research is often considered difficult during this stage because it is unsure what to ask consumers at this point. An often-heard argument is that asking consumers what they want, is useless, because they do not know what they want (Ulwick, 2002). Consumer research, however, helps to raise the odds of success in the market. Even though consumers may not always be able to express their wants, it is important to understand how they perceive products, how their needs are shaped and influenced and how they make product choices based on them. In this way, it helps to avoid working on a new product that has a low probability of success in the first instance (Rochford, 1991). Additionally, it guards against potential winning product concepts, being overlooked. As a result, carrying out consumer research in this stage is inexpensive compared to the risk of product failure. Moreover, gathering consumer understanding with the help of formal consumer research methods has the advantage that the results can more easily be disseminated across departments in an organisation (Kohli and Jaworski, 1990). Knowledge obtained through formal methods is generally used to a greater extent, most likely through its verifiability and credibility (Maltz and Kohli, 1996).

New product development (NPD) can originate from new technology or new market opportunities (Eliashberg, Lilien and Rao, 1997). But irrespective of where opportunities originate, when it comes to successful new products, it is the consumer who is the ultimate judge (Cooper and Kleinschmidt, 1987; Brown and Eisenhardt, 1995). So, in

order to develop successful new products, companies should gain a deep understanding of 'the voice of the consumer' (Thomas and Chandrasekaran, 2013). New product development (NPD) is an important driver of corporate growth and profitability (Sorescu, Chandy, and Prabhu 2003; Wind and Mahajan 1997). Unfortunately, most new products fail to deliver on their objectives (Christensen 1997). Hence, marketing scholars and practitioners have duly devoted substantial attention toward improving NPD processes. This attention has led to several important advances, including the specification of the Stage-Gate model (Cooper 1990), the formulation of sophisticated NPD tools such as conjoint analysis and pre-market launch forecasting (Rangaswamy and Lilien 1997), and advances in knowledge about how best to organize and manage NPD teams (Sethi, Smith, and Park 2001).

While everyone acknowledges, that consumer based product development, ensures NPD success, there is still a huge gap between Marketing and Product Design functions. This paper discusses a few key reasons for this gap and recommends Conjoint Analysis as an ideal tool, which overcomes all the perceived and experienced deficiencies, in incorporating the Marketing led, consumer research information, into Product Designs, by the development team.

II LITERATURE SURVEY

Development and launch of successful new products is one of the most critical yet, most challenging tasks managers face. From a strategic point of view, new products well-attuned to the voice of the customer, with perceived technical superiority, developed within budget and launched ahead of the competition provide real competitive advantages for the firm (Calantone and Cooper, 1979; Cooper and Kleinschmidt, 1987; Crawford, 1994; Hultink, Griffin, Hart and Robbenm, 1998).

Designing is a complex cognitive task and industrial designers have been increasingly challenged with the interdisciplinary nature, increasing product complexity and time pressure of modern design projects (Cross, 1994; Earl, Eckert, & John Clarkson, 2005; Freudenthal, 1999). The task of the industrial designer can generally be seen as a complex, creative and solution-focused problem solving process. This process is often characterised by a fuzzy front-end, an ill-defined problem (Cross, 2004) and the problem and solution co-evolving throughout the design process (Bezerra, 2000).

The best developed area of product design research is clearly that related to the influence of various elements of product design on the consumer decision process. Beyond simple consumer preference or choice, other outcome variables considered in this stream have been the nature of "extreme" responses to product design efforts (Allenby and Ginter, 1995), and the subjective (Luo, Kannan, and Ratchford, 2008) and symbolic (Kreuz-bauer and Malter, 2005) interpretation of design elements. Product design has also been closely tied to the study of hedonic and utilitarian benefits perceived by consumers (Chitturi, Raghunathan, and Mahajan, 2008).

Consumer research related to design uses advanced analytical tools which disaggregate and vary design elements in order to optimize customer satisfaction (e.g., Green, Carroll, and Goldberg, 1981). Other studies have considered issues such as the unity and proto-typicality of product designs (Veryzer and Hutchinson, 1998), the consequences of simple versus complex designs (Cox and Cox, 2002) and the consequences of excessive product features for the consumer (Thompson, Hamilton, and Rust, 2005). Another perspective has taken a broad yet still dis-aggregated perspective on product design by

considering a more comprehensive picture of the full range of design elements and their influence (Bloch, 1995; Noble and Kumar, 2010). In general, consumer based design research has been informative in exploring new and insightful dimensions of a product that help answer questions such as, “Just what is product design?” and “How can design influence consumers?”

Cross-functional interactions in the organization (Ruekert and Walker, 1987) consider the linkages between design and branding issues (Montana, Guzman, and Moll, 2007), links between design and marketing functions (Bruce and Daly, 2007) and general cross-functional interactions involving design in the new product development process (Antioco, Moenaert, and Lindgreen, 2008; Perks, Cooper, and Jones, 2005). There seems to be often an unstated assumption that NPD is essentially an internal, firm-based activity. As observed by (Von Hippel, 2009), “The idea that novel products and services are developed by manufacturers is deeply ingrained in both traditional expectations and scholarship.” Hence, NPD research and practice largely operates under a firm-centered paradigm in which customers are viewed as having little active influence upon NPD activity. While this paradigm may have served academics and practitioners well in the past, it is currently being challenged by the emergence of empowered customers seeking greater input and control over NPD activity (Seybold 2006). This challenge is ushering in a new paradigm in which firms can enhance corporate growth and profitability by allowing customers to take a more active role in NPD activity (Prahalad and Ramaswamy 2000; Von Hippel 2005). In this newly emerging co-creation paradigm, customers are central and vital participants in the NPD process. Despite this global wisdom, marketing and consumer information is not considered for NPD and the departmental ‘silo’ continues, perhaps due to the following reasons.

III USE OF CONSUMER RESEARCH INPUT: PROBABLE REASONS FOR NOT INCORPORATING INTO NPD

Consumer research lacks credibility:

A widespread belief among practitioners is that consumers cannot be trusted in their opinion. Several studies have shown that it is difficult to predict final consumer behavior based on consumers’ expressed attitudes towards products or certain issues. (Nijssen and Lieshout, 1995) found that users of NPD methods mention this shortcoming of forecast inaccuracies. Moreover, users mention as well, that methods are not able to capture the complexity of the market place. Another problem that plays in NPD is that consumer research is often part of marketers’ responsibility in a company. It is a well-known fact that both, Marketing and Product Design professionals do not always consider each other’s information to be credible (Song, Neeley and Zhao, 1996). Marketers are often viewed as ‘easy talkers’ by Product Design personnel, as relying too much on intuition rather than on hard facts (Gupta, Raj and Wilemon, 1985; Moenaert and Souder, 1990). If people perceive information as less credible, it means that they perceive the quality to be lower, and this will result in lower information utilization.

Consumer research does not help to come up with innovative new product ideas:

Various studies have found that the key determinant of new product failure is an absence of innovativeness, the extent to which a new product provides meaningful unique benefits. Not much confidence, however, exists among product developers that consumer research can provide a valuable contribution in the search for new and improved ways

of satisfying consumers' needs. Although it is generally believed that listening to 'the voice of the consumer' is important, the precise way of 'listening' is not always clear (Thomas and Chandrasekaran, 2013). Effective use of consumer research for this purpose has been identified as a problematic area, because it is unsure what to ask consumers (Ortt and Schoormans, 1993; Ottum and Moore, 1997). An often-heard argument is that asking consumers what they want is useless, because they do not know what they want (Ulwick, 2002). Moreover, the majority of available methods focus on evaluation of products (Wind and Lilien, 1993). In these methods, products or product ideas are presented to a sample of consumers and evaluations are collected. These evaluations are used to optimize the product or to screen and select from different product ideas, ultimately ending up with the product idea with the highest likelihood of market success (Ozer, 1999). However, these methods can be considered as reactive of nature in their use in the early stages. They constrain the researcher in the elicitation of unfulfilled consumer needs, because consumer input is restricted to responses to an already existing concept or product. A risk of relying on them solely is that they are likely to give product developers only 'me-too'-ideas, which hardly excite the consumer. (Burton and Patterson 1999) point to this problem by stating that most consumer research only attempts to build on existing and often already fulfilled needs of consumers. Consequently, the results of this kind of consumer research do not exceed common sense knowledge and hence is consistent with what practitioners already take to be true. (Smith, 2003) claims that this typically results in a 'So what, I already suspected that'-reaction on the part of the receivers of the results. In case consumer research does not exceed the intuition of end-users and solely reaffirms existing beliefs, it tends to be less used. Moreover, many studies are carried out to increase the salability of a decision. Such studies are designed after a decision has been made to gain support rather than to provide a basis for the foundation of new product ideas (Day, 1994).

Consumer research delays product development process:

Product life cycles are becoming shorter, which leads companies to reduce the time it takes to introduce new products at the market. Being early is generally believed to provide a significant competitive advantage. Companies that take too long in bringing new products to the market, run the risk that others will get there first, or that consumer needs and wants will change. Consumer research is time-consuming and extends rather than shortens the NPD process. Moreover, consumer research requires additional resource investments (Miller and Swaddling, 2002).

Consumer research lacks comprehensibility:

Consumer research must often be used by both marketing and Product Design teams. Both marketing and Product design employees often complain that they have difficulty in understanding each other. One of the reasons for this misunderstanding is that marketing has its own set of technical terms, and Product Design team has another (Moenaert and Souder, 1990). As a result, consumer research can be difficult to comprehend. Comprehensibility of information is the ease with which the receiver can decode and fully and unambiguously understand the information (Moenaert and Souder, 1996). For instance, (Dougherty, 1992) found that individuals from different functional departments understood different aspects of product development, and they understood these aspects in different ways. The difference led to varying interpretations, even of the same information.

Consumer research lacks action ability for Product Design team:

Information will be used if it is perceived to be relevant for the task for which the receiver is responsible (Moenaert and Souder, 1996; Madhavan and Grover, 1998). Both marketing and Product Design professionals need consumer information that is closely linked to their own task in the development process. Marketers generally need information about key drivers of consumer choice for the development of effective communication, product positioning and segmentation strategies. Product Design professionals, in contrast, need very concrete information about how consumer desired product benefits translate into target values for technical development (Shocker and Srinivasan, 1979; Thomas and Chandrasekaran, 2013). Product Design employees often complain that consumer research provides insufficient actionable and detailed information about consumer requirements and does not understand key issues about product development (Gupta, Raj, and Wilemon, 1985). As a result, they may reject the information, lose interest or produce their own information on desired product features with the risk that the new product will not be entirely compatible with the actual requirements consumers have (Bailetti and Litva, 1995). This need for actionable information is becoming more important than it was in the past, because individuals often feel overwhelmed by the huge amounts of information available.

IV CONJOINT ANALYSIS: A PERFECT LINK BETWEEN, MARKETING AND PRODUCT DESIGN TEAMS

The concept of conjoint analysis is described by (Hair et al 1998:392) as follows: "Conjoint analysis is a multi-variety technique used specifically to understand how respondents develop preferences for products or services. It is based on the simple premise that consumers evaluate the value of a product or service by combining the separate amounts of value provided by each attribute." (Sudman and Blair, 1998:229-230) warn that it is not a data analysis procedure like factor analysis or cluster analysis. It must be regarded as a type of "thought experiment" preferences for a product or service. (Kotler, 2000:339) defines conjoint analysis as "...a method designed to show how various elements of products or services (price, brand, style) predict customer for deriving the utility values that consumers attach to varying levels of a product's attributes." Churchill and Iacobucci (2002:748) refer to conjoint analysis as "conjoint measurement, which relies on the ability of respondents to make judgments about stimuli." These stimuli represent some predetermined combinations of attributes, and during a laboratory experiment, respondents are asked to make judgments about their preferences for various attribute combinations. The basic aim, therefore, is to determine the features they most prefer. From the definitions given above it is clear that conjoint studies centre on certain attributes of products or services and also various levels within each attribute. 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 consumer, 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. To determine strategically important customer value dimensions, conjoint analysis has been proposed (Thomas and Chandrasekaran, 2013). The results of conjoint analysis give a good picture about the importance of different product attributes in creating value for customers (Thomas and Chandrasekaran). 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. While market research can help us determine the “what” of customer needs in the marketplace, it rarely explores the “why” sufficiently uncover information and gain insight into how better to stratify offerings and the attributes of those offerings. This information can help us build a strategy for maximizing the potential of these offerings to specifically targeted segments. In real-life situation respondents may find it difficult to indicate which attributes they considered and also how they combined them to form their overall opinion. The value of conjoint analysis lies in the fact that it estimates how much each of these attributes is valued, and as Churchill and Iacobucci (2002:748) state, “...the word conjoint has to do with the notion that the relative values of things considered jointly can be measured when they might not be measurable if taken one at a time.”

1) The value of conjoint analysis in consumer research:

In conjoint analysis respondents indicate their preference for a series of hypothetical multi-attribute alternatives, which are typically displayed as profiles of attributes. The responses to these profiles are analyzed to yield estimates of the relative importance of the attributes and to build predictive models of consumer choice for new alternatives (Oppewal and Vriens, 2000). Conjoint analysis is a dependence technique that has brought new sophistication to the evaluation of objects, such as new products, services or ideas (Hair et al, 1998:15). The theory and methods of conjoint analysis deal with complex decision-making, or the process of assessment, comparison, and/or evaluation. Conjoint analysis is closely related to traditional experimentation. The conjoint technique developed from the need to analyze the effects of the factors we control that are often qualitatively specified or weakly measured. Conjoint analysis is actually a family of techniques and methods, all theoretically based on the models of information integration and functional measurement (Hair et al, 1998:388). Utility is a subjective judgment of preference unique to each individual. It is the conceptual basis for measuring value in conjoint analysis. It is a measure of overall preference because it encompasses all product or service features, both tangible and intangible. Utility is assumed to be based on the value placed on each of the levels of the attributes and expressed in a relationship reflecting the manner in which the utility is formulated for any combination of attributes (Hair et al, 1998:392).

2) Key steps when designing a Conjoint Value Analysis:

There are many different conjoint methods. The researcher should weigh each research situation and pick the right combination of tools for the project. (Sudman and Blair 1998:235) distinguish between an arrangement that uses all possible combinations of features (“full factorial design”) and one that uses only some of the combinations (“fractional design”). A general rule of thumb, according to these authors, is to limit the descriptions to no more than 30. Full-profile conjoint value analysis (CVA) is useful for measuring up to about six attributes (Hair et al, 1998:401). CVA calculates a set of utilities for each individual, using traditional full-profile card-sort (either rating or ranked) or pair-wise ratings. If the full-profile approach is used, it is important to limit the number of attributes and levels, increase the number of profiles, or use more parsimonious models (such as the vector or ideal point models) so as to increase the degrees of freedom for conjoint estimation (Green and Srinivasan, 1990). Figure 1, summarizes the selection of Conjoint Analysis methods and Figure 2, details the steps that needs to be carried out, while using the Conjoint Analysis Evaluation.

Hair et al (1998:400-436) provide a comprehensive description of the design of a conjoint analysis experiment (see figure 1). The Hair model consists of seven phases, which include 14 steps.

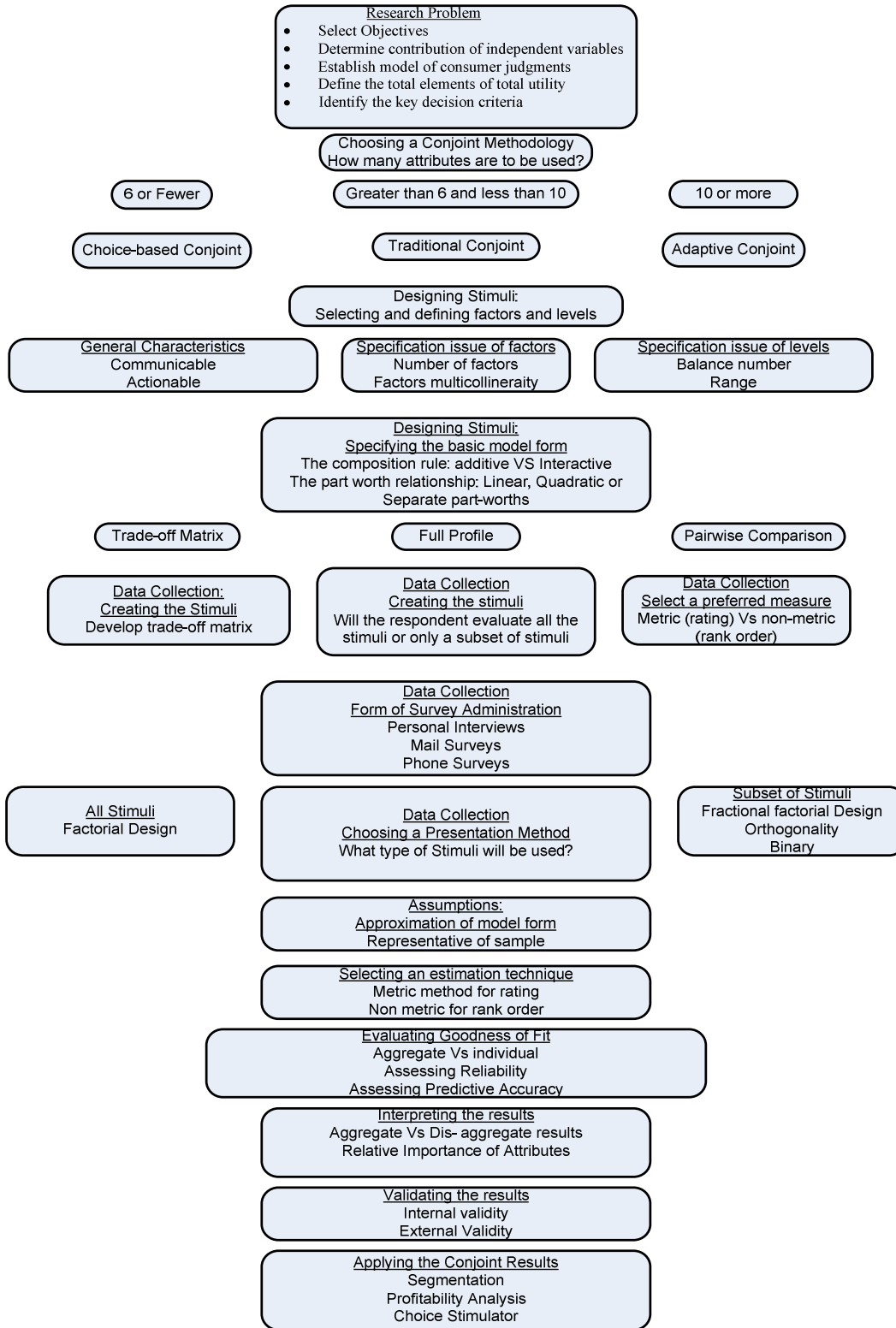


Figure: 1 Key Decisions while conducting a Conjoint Analysis (Hair et al, 1998:401-419)

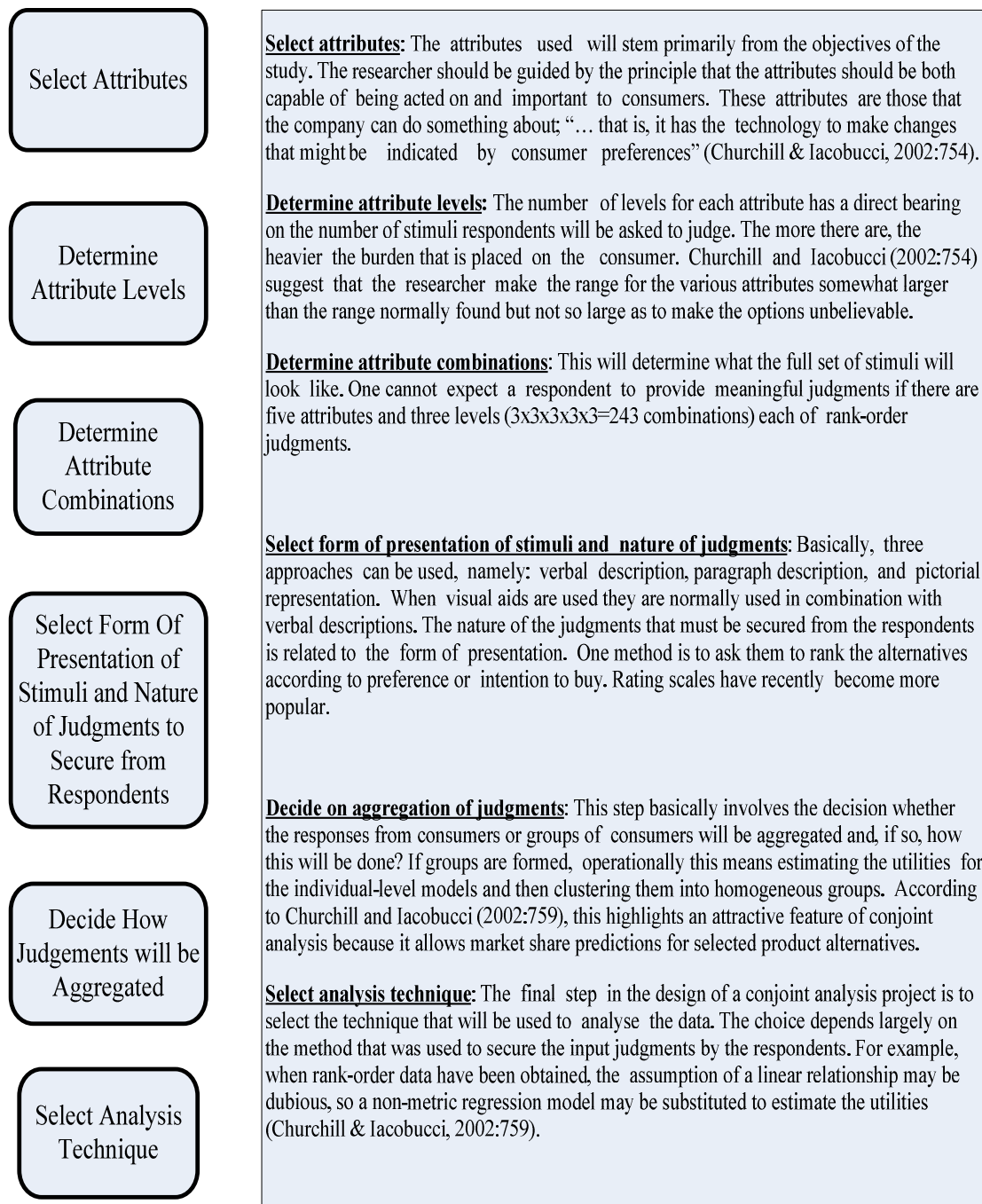


Figure 2: Designing a conjoint analysis experiment: Stages of the conjoint analysis decision diagram (Adapted from Churchill & Iacobucci, 2002 p 753)

V CONCLUSION

According to (Hair et al, 1998:436) conjoint analysis places more emphasis on the ability of the product designer to theorise about the behaviour of choice than it does using other analytical techniques. The critical interplay between the assumed conceptual model of decision-making and the appropriate elements of the conjoint analysis makes this a unique multivariate method (Hair et al, 1998:436).

Conjoint Analysis (CA) techniques using direct voice of the customers, through the various VOC Translation tools (Thomas and Chandrasekaran, 2013) ensure that, every "Voice of customer" is captured and objectively and statistically, filtered. Therefore it is credible data, that Product design teams can make use of. The use of Kano analysis, in the early stage, as an input to CA, ensures that, stated and unstated needs of the customer, is captured. This leads, to innovation. The use of statistical Design of experiment (DOE) tools ensures that, the number of 'experiments' that needs to be conducted, is optimal, thus saving time and resources. The use of CA speeds up the development, rather than, delay product development. The multiple regression analysis and the output, of the statistical analysis ensure that the consumer research data is 'simplified' comprehensibly and the resultant, optimal design, ensure that, it is actionable and executable. Application of Conjoint Analysis, to New Product Development (NPD), ensures that Customer is indeed a King.

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