

# Customer-Driven Engineering for Developing a "Hit" Product Targeted at Leading Edge Boomers

by

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Bachelor of Mechanical Engineering  
University of Detroit, 1992

Submitted to the System Design and Management Program in Partial Fulfillment of the  
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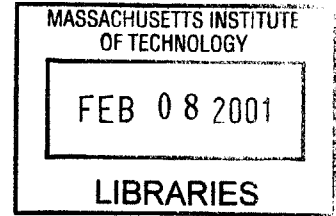
**BARKER**

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## **Abstract**

Dramatically improving customer satisfaction contributes to the leading objective at Ford Motor Company. A realization has been made that a strong customer focus is quintessential in surviving in today’s competitive markets. The level of satisfaction is predominantly formed from the customer’s impression of the product. Consequently, a far greater focus and understanding must be applied to the relationship between the customer and product, as the product represents the greatest leverage point in impacting customer satisfaction.

The study presented in this thesis involves a “voice of the customer” analysis of the Leading Edge Boomer (LEB) consumer base’s insight into current and future vehicle needs. This analysis remarkably aligns knowledge and focus with the primary value of Ford Motor Company’s business acumen: customer satisfaction.

The outcome of the study provides key voice of the customer values, a solid set of principal attributes and LEB market segmentations, compiled through principal component and cluster analyses. This thesis also addresses the integration of the results into the product development designing and engineering stages via the Kano model. A holistic review of the customer voice extraction methodologies and integration into the product development process will also ensue with the incorporation of inconsistencies and relevant heuristics for resolution.

Thesis Supervisor: Drazen Prelec  
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**-C.M.R**

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# 1. Introduction

## 1.1 Motivation

With increasing strides being made by product manufacturers towards customer satisfaction, we are seeing a greater involvement of customer input throughout the R&D, engineering and manufacturing stages of product development. The Voice of the Customer (VOC) is an independent variable that will influence product design and, in turn, customer satisfaction. It is full-circle customer involvement. The VOC is a crucial link in ascertaining market research data that will provide both strategic and operational decisions. In an automotive significance, for example, strategic decisions would provide input as to whether a vehicle should be designed to facilitate a trip to the mountains or provide luxurious accommodations used primarily for a night out on the town. Operational decisions are more focused on the layout of the vehicle's various controls and features with respect to the occupants.

The automotive industry is becoming increasingly complex through an attempt to maximize commonality, yet, at the same time, maintain distinct brand images for an extremely large and diverse consumer base. By getting in touch with consumers' desires, needs, experiences, feelings and values it is much easier to effectively target the customer segment.

## 1.2 Rationale of the Study

Ford's Consumer Relationship Process is defined by "*A sustained relationship with the consumer through the development of consumer insight, which is used in the development and delivering of products and services.*"

The Voice of the Customer plays a critical role throughout the entire product and process development execution. In the initial stages of defining the product and process, consumer requirements must be translated into program targets, marketing plans, engineering and design plans as well as product and process specification plans. During the designing and modeling of product and process, consumer requirements must be integrated concurrently with several other requirements (engineering, manufacturing, etc.) in order to deliver a high quality product and process. The final stages of verification, building and producing the product and processes demand an integration between optimized designs, the

manufacturing process and production-like simulation to ensure consistency with consumers and satisfaction of their needs.

The study to be performed will focus on one of the common links apparent through each phase of the product development cycle, the customer. The procedures used to gather customer voices, translate them into customer requirements and the attempt to determine product likes and dislikes, opportunities for improvement and attributes to satisfy unmet needs will be illustrated through the analysis. LEB market segmentation will also be studied through the use of cluster analysis. The study will review the effects of how this customer-related information is applied in the product development process through the Kano model approach.

### **1.3 Synopsis of the Study**

This thesis was being done in conjunction with a team at Ford that is attempting to determine the requirements for a vehicle to be targeted at the Leading Edge Boomer (LEB) demographic. There are several qualifications of this particular group that will be discussed later, in Chapter 3. The goal is to develop a “hit” product for the LEBs as they transition into life’s later stages. There is a confidentiality matter with some Ford Motor Company data discussed, so some of the data will be skewed in order to protect the sensitive material.

Chapter 2 discusses three methodologies used currently in gathering customer-oriented information. Occasionally, simple applications of the methodology to the automotive industry are interjected for explanatory purposes. *The Voice of the Customer* (Griffin and Hauser, 1993), the *Zaltman Metaphor Elicitation Technique* (Zaltman and Coulter, 1995) and *Voices into Choices: Acting on the Voices of the Customer* (Burchill and Hepner-Brodie, 1997) are the three techniques on which the discussion is focused.

Chapter 3 examines the complete VOC methodology and illustrates its workings through the study’s focus on a targeted group, using the *Voices into Choices* application. A set of key attributes that satisfy the derived customer requirements are the result of the analysis. A questionnaire was designed based on these key attributes and administered. The responses were then subjected to cluster and factor analyses and the results are discussed on their relevance.

Chapter 4 addresses the applicability of the findings from Chapter 3 in the product development process, and exploits the use of the Kano model in explaining the importance of the customer's role in guiding the engineering of a product.

Chapter 5 formally summarizes the study's results in addition to applicable heuristics in the area of customer voice extractions and integration with the current product development cycle. Inconsistencies with the individual approaches are noted and described with regard to their applicability and value potential to Ford Motor Company.

## 2. Practices in Knowing the Customer

### 2.1 Overview of Customer Focus

Satisfying your customers' wants beyond that of your competition is recognized as a key to success in the marketplace today. For this to happen, the product development teams, comprised of engineers and designers, must be equipped with the ability to extract greater detail about customers needs than what is typically offered by standard market research. Presently, not only do the companies themselves want to focus on the customer, but clearly, consumers want to have more influence over the way products are developed today than ever before. It is necessary to focus on the consumer so that we may answer product design-related questions: (1) What exactly do consumers value? (2) Of all their values, what are the true requirements we need to focus our attention on to achieve maximum benefit and customer satisfaction?

The techniques used in this study to elicit customer data were based upon *The Voice of the Customer* (Griffin & Hauser, 1993) and the *Zaltman Metaphor Elicitation Technique* (ZMET) (Zaltman and Coulter, 1995) with *Voices into Choices* (Burchill and Hepner-Brodie, 1997) being the official methodology applied in the study.

The terms "customer", "consumer" and "participants" are used interchangeably throughout this document.

### 2.2 The Voice of the Customer Approach

This methodology focuses on the Voice of the Customer as a component of Quality Functional Deployment (QFD). The sections of interest applicable to this study are the three stages attributed to identifying, structuring and prioritizing customer needs. According to Griffin and Hauser (1993), "A customer need is a description, in the customer's own words, of the benefit to be fulfilled by the product or service." The customer's needs should not be viewed as an answer to a problem or as a means of measurement by which to evaluate, but rather as an individual account of what they expect, want or desire out of a product.

Typically, 200-400 needs come from any interaction with customers, which can be broken down into three classifications. The basic needs express what they, the customer, assume the product does, articulated needs state what they want the product to do, and exciting needs are ones that delight the customer if those needs are satisfied. These customer

needs must then be structured into a hierarchy due to the amount of detail captured in this large list. The QFD plays a role here in structuring the needs into primary, secondary and tertiary needs.

The primary needs, also referred to as strategic needs, are the five-to-ten most important needs used in setting the strategic direction of the product. In this study's case we look at the vehicle from several viewpoints: Whether the vehicle should be designed to perform with the functionality of a sedan or a truck; be luxurious or more conservative; ride and handle more like a sedan than a truck; easy accessibility or a higher ride; the amount of safety to be incorporated; any combinations thereof, and so on.

The primary needs are then refined into approximately three-to-ten secondary needs, also known as tactical needs. These needs are a more specific indication of where efforts should be focused in order to fulfill the primary (strategic) needs. For example, if the comfort of a sedan-like ride is considered a primary need, then the secondary need will express how the customer judges a comfortable ride. It may be a luxurious leather seat, an adjustable steering wheel, no outside noise in the interior cabin area or possibly something as simple as the headrest shape.

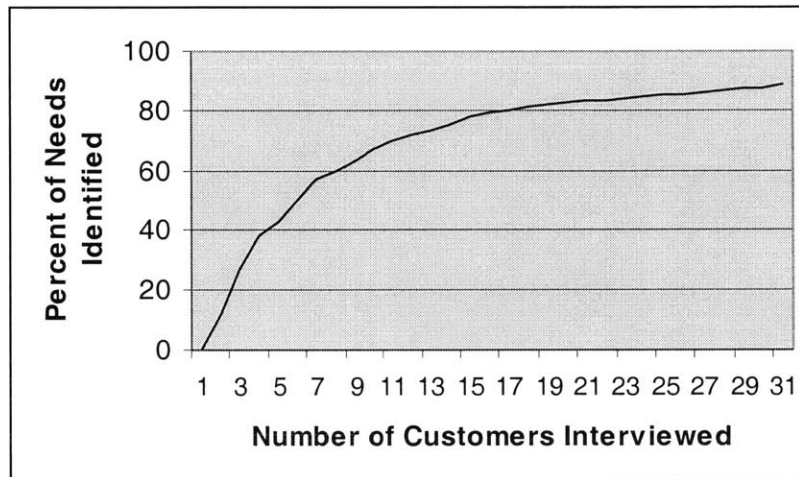
The tertiary needs, also known as operational needs, are an even more detailed collection of data that aid engineers in designing solutions that mitigate the secondary (tactical) needs. For example, a luxurious leather seat (a secondary need) may be judged on tertiary needs such as: the smell of the leather, the range of seat adjustability, how plush the seat is, the contour or the way it conforms to one's body.

### **2.2.1 Identifying Customer Needs**

A typical study involves between 10 and 30 customers interviewed for approximately one hour in a focus group setting, a mini-group (2 or 3 customers) or a one-on-one situation. Many techniques and methodologies exist as a means to elicit information from the customer during the three aforementioned scenarios. During interviews, questions may be posed in a hypothetical manner or directed at real life experiences. Interviewees may be asked to visualize themselves in various situations or be shown an image and asked to comment on its significance to a related topic. The interviewer continually probes for deeper understanding of any needs voiced by the customer during the interview. Latent needs are more likely to emerge when probing techniques are exhibited. Essentially, the interviewer is



striving to gather the relative customer needs with regard to a specific product or service on all levels of abstraction. Once the interviewer feels that no more pertinent information can be gleaned from the interview it is ended. **Figure 2.1** indicates the percentage of detailed customer needs identified in relation to the number of customers interviewed. Twenty to thirty interviews normally suffice to ensure majority coverage of all needs. The reason it does not illustrate capturing 100% of the needs is because it estimates the average number of needs and considers the probability of certain customer needs being identified in a given sample. Simply put, it estimates the number of needs that were not mentioned once in the thirty separate interviews.



**Figure 2.1 - Percent of Needs Identified versus Number of Interviews (Griffin and Hauser 1993)**

It should also be noted that a similar graph states the percent of needs identified against the number of analysts (Griffin and Hauser, 1993). It is estimated that seven analysts would identify 99% of the customer needs within a given set of transcripts while one analyst would identify approximately 55% of the needs. As suggested, the percentage of needs obtained decreases as the number of analysts decreases.

### **2.2.1.1 One-on-One Interviews or Focus Groups**

Focus groups have been favored by many market research firms based on the hypothesis that a group dynamic fosters a healthier and more varied production of customer needs. This is due, in part, to expanding on other group member ideas. There is always

concern for dominating group members who may try to monopolize the conversation. It is up to the moderator to prohibit this from occurring. However, studies have been performed in this area to test this hypothesis. One study (Silver and Thompson 1991) basically states that two one-on-one interviews at one hour in length produce essentially the same amount of customer needs as a two-hour focus group. “In other words, an hour of qualitative interviewing appears to be an hour of qualitative interviewing independent of whether one uses focus groups versus one-on-one interviews.” (Urban and Hauser, 1993). Furthermore, two one-hour interviews are much lower in cost than a focus group for two hours, which implies one-on-one interviews are more cost efficient.

A compilation of one-on-one interviews and focus groups were used in providing customer voices in this study and there were no obviously apparent group dynamic benefits.

#### **2.2.1.2 How Many Customers Do We Need**

Acquiring the majority of customer needs implies that a certain number of people need to be interviewed. The number of people used falls subject to several conditions: What will the budget allow? How flexible are the time constraints? How important is it to get most of the *exciting* needs? Are the necessary resources available to allocate? Again, Figure 1.1 shows the relationship between the number of needs identified and how many people will be required to realize the outcome.

#### **2.2.1.3 How Many Analysts Do We Need**

Normally, one will find about four to six analysts reading and analyzing transcripts in order to identify customer needs. However, qualitative experts are relied on as well. Note that differing backgrounds should not be overlooked, for a number of diversely experienced analysts will uncover a far larger set of customer needs than any single expert. Experts tend to bring too many preconceived notions into the scenario, which in turn hinders their ability to see the *exciting* or *latent* customer needs. According to Griffin and Hauser (1993) multiple analysts should read and interpret the transcripts. Based on their study it is estimated that 99% of the customer needs may be obtained with seven analysts.

## 2.2.2 Structuring Customer Needs

There are two prevalent structuring methods where one is performed by the product development team and the other by the customers, themselves. The group consensus process (product development team) involves the use of affinity and tree diagrams. The customer-based process requires customers to sort and cluster customer needs.

### 2.2.2.1 Group Consensus Structuring Method

This method puts the onus of structuring the customer needs on the product development team. In order to create the affinity diagram, the team is responsible for grouping *similar* customer needs (which are written individually on cards) into a number of separate piles. Discussion among the team is encouraged during grouping of the cards to ensure the need is clearly understood and buy-in from the team is reached. This continues until all cards are categorized. The individual piles will differ from the others in some manner. Each pile is then arranged into a hierarchical tree diagram. That is to say, the needs are sorted so that the tertiary (more-detailed) needs are placed in a lower-level, whereas the strategic and tactical (primary and secondary) needs are placed in higher-levels. For example, a tactical (secondary) need would be able to represent a group of tertiary needs in a higher abstraction level. If this is not feasible, select a tertiary need to represent the group, or create a new group title based on the tertiary relevance.

### 2.2.2.2 Customer Structuring Method

Similar to the group consensus process, the customers are supplied with cards, each containing a single customer need, which they group into piles, based on similarity. Once the sorting is complete, they choose a single need that is the most representative of that pile of needs. This chosen need is referred to as the exemplar. A co-occurrence matrix is then created based on the number of respondents who placed need  $x$  in the same pile as need  $y$ . Each exemplar is also kept track of for the number of times it was chosen as such. The co-occurrence matrix is then clustered (using Ward-based clustering methods) to develop the structured hierarchy. The exemplars are then used to name the cluster and, if required, a title may be created. The use of exemplars is preferred in an attempt to maintain the *true* customer voice.

### 2.2.2.3 The Product Development Team vs. the Customer

Griffin and Hauser (1993) conducted studies in which they found the customer sorting process being more favorably accepted by both the customer and group consensus teams. The fact that the customer-sort hierarchy charts maintain a stronger hold of the *actual* customer needs as they are voiced and more easily understood, representative and workable data resulted. The customer-sort charts seem to be based on how the product is used, whereas team-consensus charts are based on how the product is built. The group consensus teams tended to create new labels for groupings, which, in some cases, may be obscuring the customer voice. However, the team-based consensus charts have the advantage of solidifying the buy-in mentality of the hierarchical structure from the design-group standpoint. There have been instances where the group consensus teams have worked concurrently on the customer sorting process with customers and they have found themselves thinking, “How would the customer sort this?”

### 2.3 Zaltman’s Metaphor-Based Research

Organizations today have become quite proficient at presenting what products have to offer the customer, but most still lack the ability of efficiently and effectively extracting the deep, latent needs concealed within the customer. Human thought is image-based and language can be a very poor communicator of our deepest thoughts and feelings. The Zaltman Metaphor Elicitation Technique (ZMET) is designed to essentially translate consumers’ thoughts, behaviors and feelings into a tangible state. It is a tool that aims to tap into the consumers mental models responsible for driving their thinking and behavior and illustrate these models into a physically attributed concept using the language of metaphors as the translator. Just to see an image, one must project his or her thoughts, convictions and experiences onto and into its field. The perceiving mind is than able to contribute to the image as much as it borrowed. According to Gerald Zaltman (1996) the ZMET process must address several different premises to better understand the voice of the customer:

- **Most human communication is non-verbal** – Most stimuli reaching the brain are non-verbal and most images used in daily life are visual (Kosslyn et al., 1990). Nonverbal language also includes paralanguage: the timbre, pitch, tempo, etc., that can convey the feeling of something very different than what is actually being said.

- **Thoughts occur as images** – The representation of a thought will frequently take the form of non-verbal images but are always expressed as verbal. This creates the potential of misconstruing the actual thought. Customers must have a way to convey their thoughts non-verbally.
- **Metaphors as essential units of thought** – According to Lakoff and Johnson (1980) “The essence of a metaphor is understanding and experiencing one kind of thing in terms of another.” The metaphor affords the consumer the opportunity to express their own thoughts, feelings and behavior in terms of images in a structured fashion.
- **Sensory Images as metaphors** – All ideas, notions, concepts and thoughts that originate in our minds are inspired by some form of sensory stimulation. The majority of the mental images are visual, so a consumer can convey personal thoughts through the likes of pictures or drawings.
- **Mental models as representations of stories** – Knowledge and behavior are captured in the form of mental models. “...the major processes of memory are the creation, storage and retrieval of stories.” (Schank, 1990). Stories may be thought of as metaphors for knowledge, which enlightens us to the consumer’s reasoning process.
- **Deep Structures of thought can be accessed** – All consumers have pertinent thoughts or information about a product but, in many cases, have difficulty articulating what it is they want to reveal. Latent thoughts are buried so deep the consumer does not even realize it is a concern but will share their own thoughts once they are triggered.
- **The co-mingling of reason and emotion** – Reason and emotion must be tightly linked when difficult-to-retrieve thought structures are uncovered. Any conflict between the two will result in the contamination or loss of potentially very important information.

*“Paradoxically, the great majority of all market research techniques is verbo-centric, i.e., they rely on literal, verbal language.” (Zaltman, 1996)*

Many critically relevant “voices” have been potentially lost by reason of this narrowed mentality, which only enforces the rationale for pursuing the alternative approach of using the consumer’s visual and sensory images in obtaining the voices of the customer.

### **2.3.1 The ZMET Process**

Typically 20 people will be selected based on screeners to participate in the project. The participants are provided with information about the topic to be studied. In our case we will say we want their perception of what their ideal vehicle should be like. They are then instructed to collect approximately 12 pictures (from magazines, books or any other source) and/or take photographs of anything (ideas, concepts, animate or inanimate objects, etc.) that instills an image in their mind of what they feel their ideal vehicle should or should not be like. The act of picture collection is beneficial since it enforces the customers to familiarize themselves with the topic prior to the interview occurring. A one-on-one interview is conducted seven to ten days later.

The interview is structured as a “guided conversation” with a time approximation of two hours in length. The guided conversation style of interview is believed to produce more reliable, valid and relevant data than interviews more formally structured. The customer having control over the pictures used in the interview is another critical factor in achieving greater-valued data. Note that, since our topic deals with vehicles, they would not be allowed to choose any pictures of vehicles for the interviewing process. This forces metaphor usage slightly more on the interviewee.

#### **2.3.1.1 The Various Steps of ZMET**

There are a variety of steps that are at the interviewer’s disposal but only a few per interview are selected, based on the nature of the topic.

- **Storytelling** – The customer is provided a forum in which they may voice their stories. According to Schank (1990) human memory and communication is story-based and, since the participants have had over a week to think about the topic, they invariably have a story to share. To illustrate one example, we might see a picture of a couple in an open field with the breeze blowing through their hair. The participant may tell a story about a

beautifully scenic ride they took in a convertible once and how he wished his family was there to enjoy it with him.

- **Missed Issues and Images** – The customer is given the opportunity to indicate any instances in which he or she were unable to find an appropriate picture. They are then invited to talk about what that picture might have been. This step addresses any late-coming thoughts the customer may have had.
- **Sorting Task** – The participant is then asked to arrange all of their pictures into piles based on some common link. The piles are then labeled with a relevant title or description. No restrictions are put on either the number of piles or pictures in the pile. The titles, or descriptions, in this case, become the constructs through the eyes of the customer. A construct is a higher-order abstraction (i.e., “*easy to handle*” would be the construct for a group of quotes like, “*it drives well in the snow*” and “*the tight steering gives it good maneuverability*” and “*it floats over the potholes in the road.*”)
- **Construct Elicitation** – Modified versions of the Kelly Repertory Grid and laddering techniques (Kelly, 1963) are utilized in this step. The Kelly Grid technique exposes the participants’ thought process in the sorting of the pictures. The participant is asked to choose three pictures randomly and express how two of the images are similar yet different from the third. The laddering procedure is then used to elicit a deeper understanding of the constructs used to describe the similar picture grouping and the stand-alone picture. For example, suppose two pictures were chosen, one of a recliner chair and the other of cotton balls, and stated to represent comfort. Laddering type questioning would then be used to gather a deeper understanding of the customers interpretation of “comfort.”
- **Most Representative Image** – This is just as the title suggests. The picture that represents the customer’s feelings the strongest. It could be in a negative or positive way. The interviewer probes for an explanation as to why it triggers this feeling.

- **Opposite Image** – Again, this is as the title suggests. The participant is asked to select an image that motivates a negative feeling or image in his or her own mind with respect to the topic of the project.
- **Sensory Images** – In this case, the participant is asked to use his or her senses in to convey thoughts. Essentially they are asked to apply sight, smell, sound, taste, touch and emotional feeling to the topic being studied. People utilize their senses constantly, which inspires sensory thoughts. These thoughts are obviously transformed into images, which become very important when described in relevance to the concept being explored. The descriptions are most valuable when the reference to the concept is in a “*what it is*” and “*what it is not*” formulation. In the case of our vehicle, we might hear that the car *tasted* like rich chocolate mousse, not like sour milk. Or possibly, it *sounded* like an explosion, not like a soft breeze through the trees. Each image is probed for a deeper understanding.
- **The Mental Map** – At this stage, all of the previously mentioned constructs are reviewed for their accuracy, and any additional constructs may be discussed. The participant is then asked to illustrate how the constructs are interrelated by connecting them, based on their relation to the topic, in a map-styled diagram. A summarized version of a vehicle-associated mental map is illustrated in **Figure 2.2**. The map is based loosely on customer data collected and is for presentation purposes only.



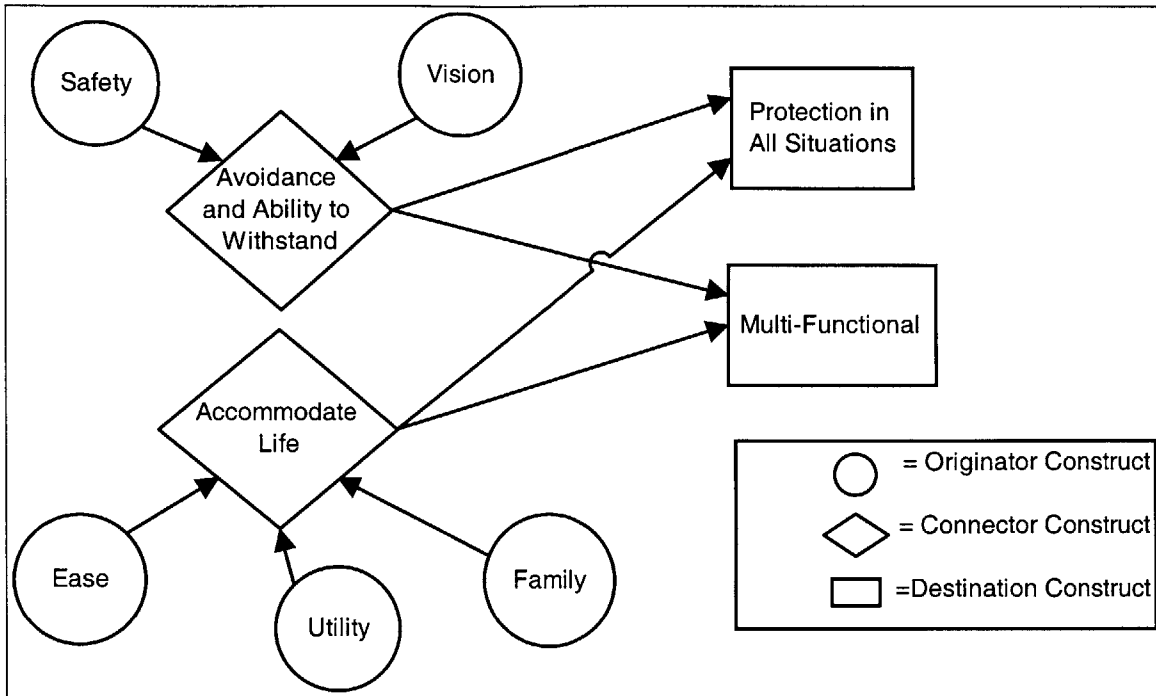


Figure 2. 2 – An Abridged Mental Map in Relation to a Vehicle

- **The Summary Image** – This step involves the aid of digital imaging techniques on a computer. The participant (with the aid of a technician) will create his or her own collage with scanned images of their pictures. They have complete freedom with use of color, sizing, positions and even textures. Once the collage is completed, the participant elaborates on their individual visually depicted story.
- **The Vignette** – The participant has a chance here to become a playwright, so-to-speak. They are asked to create a scenario that has some relevance to the topic at hand. It may have a positive or negative connotation to it, but nonetheless, it allows the customer to freely communicate any issues perceived as important.

### 2.3.1.2 Identifying Themes

After collecting all the information from the interviews, the team begins to identify the key constructs from the interview transcripts. The constructs may range on the extreme ends of the scale in negative or positive imagery. The number of constructs extracted will vary with projects and participants.

### **2.3.1.3 Coding the Data**

From the key construct list, data are then coded based on relationships. The causal relationship needs to be determined between the construct pairs. The construct pairs are typically created in the Storytelling, Missed Issues and Images, and Construct Elicitation steps.

### **2.3.1.4 Constructing the Consensus Map**

The consensus map is created by analyzing the construct pairs of each participant against those of others. The number of participants who mention a particular construct or a relationship between construct pairs provide each construct with a utility weighting, which if high enough, will allow them to be part of the consensus map. The consensus map is generated from the construct list and resembles the mental map shown in Figure 2.2. However, the consensus map contains both *direct* and *indirect* linkages between the constructs, and the interviewing group as a whole creates these links. The consensus map has critical importance because it illustrates which constructs will be affected when manipulations are performed on another. For example, interior configuration takes on added meaning when thought of in relation to the accommodation of people, loading capacity, safety and ergonomics. The consensus map provides the necessary insight into where the beginning stages of design should be approached.

## **2.4 Voices into Choices**

Voices into Choices is a very comprehensive application encompassing the steps required to complete a project from beginning to end. We are concerned only with the sections regarding data collection and understanding the voices.

### **2.4.1 Data Collection**

It is important for the interviewer to immerse themselves as intimately as possible into the customer's behaviors, surroundings, policies, processes, etc. By way of entering the customer's world one can build tacit knowledge and absorb images that will provide a full 360-degree customer perspective. This relationship becomes a beneficial factor during the interviewing process. It is advisable to take any observation notes that appear to be relevant throughout this entire process for use later in the analysis stage. When interviewing a

customer there are four basic guidelines that must be followed. The mental images collected prior to the interview aid in better understanding the customer, his or her responses and how to counteract with appropriate questions. Inquire about the customers' past experiences with the product. Allow them to explain about the problems, concerns or issues they have encountered. What are their unmet needs? There needs to be questioning about current conditions. The fact that it's current suggests that relevant issues are fresh, clear and part of their immediate life. Present mindsets are more easily probed for current expectations from a product. How is the product meeting their requirements and how is it not? This leads directly into the last section, the future product. Asking the customer about their *ideal* product opens an avenue that provides them the opportunity to voice their desires, likes, needs and expectations. Occasionally latent needs will be exposed when customers are offered the freedom to express themselves, especially in a futuristic nature.

#### **2.4.2 Understanding the Voices**

There are three analytical paths that are available, and the choice becomes dependent upon “what you want to accomplish” and the “time you are able to allocate” to the analysis. The *targeted path* is the simplest because it focuses the analysis on customer statements that provide insight into the one key question that is most relevant to the study. It is best suited for problems that are straightforward or require identification of main themes in very generalized cases. The *systems path* is best suited for problems where you are dealing with a system (or part of) that is multi-dimensional and influenced by a diversity of dynamics. The *requirements path* is the format applied in this study and thus greater detail of that particular application is presented.

##### **2.4.2.1 The Requirements Path**

Understanding customer requirements, in our case, for a product, is the ultimate purpose of this specific method. It is applicable to completely new products or the re-designing of existing ones. This approach inevitably reveals concerns and unmet needs being experienced by consumers and aids in transforming them into performance requirements. These requirements will then serve as a stepping stone in obtaining the specific requirements most important to the customers.

#### 2.4.2.1.1 Identifying the Key Customer Concerns

The first step is to individually identify customer *need* statements formulated around the voices identifying an issue, need, concern, image, problem, or solution that will help us understand customer requirements. Highlight these need statements (which may be a phrase, sentence or paragraph) throughout the entire interview transcript, keeping in mind the key identifiers. It is also important to review one's observation notes for any images or insights experienced previously and which now have significance. The highlighted voices should then be written on small cards or self-stick notes. Each card should be coded so that a specific interview and page can be referenced easily, if necessary. It is possible to identify between 50 to several hundred voices from the transcripts during any one project. There is an optional step in which many statements may be reduced down to approximately twenty-four. This is performed by selecting only the strongest-viewed voices from piles categorized based on similarity. This process of grouping and selecting is continued until there are about two dozen voices remaining. This step was not performed, since it is not advised when the development of a new product is involved, since additional voices provide greater insight.

#### 2.4.2.1.2 Constructing the Requirement Statements

The second step involves translating the voices of the customer from a state of extreme vagueness or specificity to a language that describes clear, distinct performance requirements for the product. The first sub-step involved requires the use of a translation worksheet. **Figure 2.3** illustrates the worksheet and its function. Essentially, a single customer voice is chosen and recorded verbatim. Next, list any issues or considerations that provide a bridging between the voice of the customer and the requirement to which they seem to be directing their attention. Anything that may have been observed or heard in an interview or that can relate through experience is worth listing. From those key items construct an explicit sentence that encompasses the essence of the requirement that needs to be addressed in order to satisfy the customer's needs. There are a few guidelines to follow when creating a requirement statement. 1) Use a simple sentence structure. 2) Use action verbs but avoid the use of "is" and "are." 3) Avoid "must" and "should," which indicate a lack of multi-valued language. 4) Use of "and" typically indicates one is working with more than one requirement.

**Customer Voice:**

By sitting higher up I feel safe, I can see who's coming, what's going on and my vision isn't impaired at all.

**Key Items:**

See better higher up

See farther ahead

Fewer blind spots

Easier to plan moves

Feel safer

**Customer Requirements/Needs:**

A vehicle designed with enough height to create a greater unobstructed view of the driver's surroundings.

**Figure 2.3 – A Translation Worksheet used to Construct Customer Requirements from the Actual Voice of the Customer**

Be adamant about drawing upon any of the images and tacit knowledge gained that is enlightening to the customer's world. Recalling that experience will truly benefit the quality of the requirements produced. Repeat this procedure until all customer voices have an associated customer requirement statement.

**2.4.2.1.2 Prioritizing Customer Requirements**

This step will help determine which requirement statements are most valued by the customer and create an affinity diagram from that distinction. That is an important issue because it is possible we may be dealing with many customer requirements at this point and they are not all weighted equally with regard to importance. It will then be possible to prioritize the requirements based on customer contribution. A continuous point of focus must always be present in order to frame our thinking through this critical part of the process. Therefore, there needs to be a constant referral back to the question, "What are the

key customer requirements for \_\_\_\_\_?” In this study, “the ideal vehicle” could potentially be used to fill in the blank.

There may be a necessity to reduce the requirement statements if several requirements were derived per the individual voices. It was not a necessary step in our study. If it were required, the steps previously mentioned in the *Identifying the Key Customer Concerns* section would provide the required guidance to perform this activity.

Creating the *Level-1* groupings is fundamentally based on relationships between the customer requirements. All requirements must be sorted into common, yet semi-concrete classifications with the project’s target playing a role in the thought process. A low level of abstraction should be maintained for the Level-1 requirements, basically one level above the customer requirement itself. Avoid grouping with a cause-and-effect bias: They tend to be solution-oriented. Keep arranging the customer requirements until you are satisfied, there should be approximately 8 to 12 Level-1 groups comprised of 2 or 3 customer requirements each. To start writing the Level-1 titles, focus on the inter-relationship between the requirements and create a new requirement inherent to the images, thoughts, ideas or concepts the relationship inspires. The Level-1 title should avoid repeating the requirements contained within that grouping. Design them to be concrete and practical.

At this stage, the approach requires a final, *Level-2*, grouping and titling of the requirements. This process is identical to the one applied on the Level-1 groups and titles. The Level-1 titles are grouped in accordance to similar themes. There seems to be an associated difficulty in writing a Level-2 title due to larger scaled themes and the disposition of high level abstractions. There needs to be a defined proclivity toward the *key question* yet it still must assert a sense of generality.

The affinity diagram now has the ability to be actualized. It essentially presents the requirement statements, Level-1 titles and Level-2 titles in an easily understood visual format. Refer to **Figure 2.4** for an example taken from a report on the concept of a new cordless Black & Decker jigsaw.

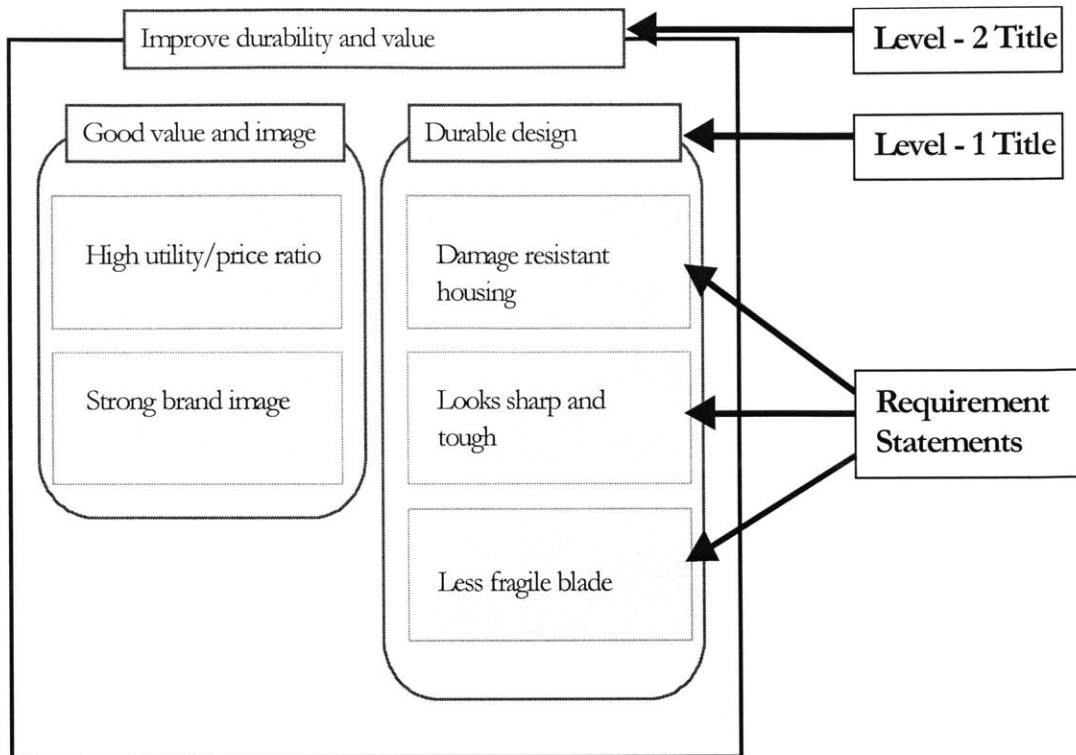


Figure 2. 4 – Affinity Diagram of “*Improve Durability and Value*” for a Cordless Jigsaw Concept

At this point, the most valuable requirements derived from the voices of the customers have been identified. There now needs to be a prioritization of the affinity diagram requirements by a larger sample size of the customer base. It is standard practice to questionnaire approximately 100 to 150 customers per market segment. The *Importance Questionnaire* is one method for gathering feedback for prioritizing the requirements developed. It is a good rule of thumb to distribute the questionnaire to everyone interviewed including any other customers, if possible. Questions are typically posed for each of the Level-2 title requirements with a scaled importance rating as a means of responding. There are a variety of scales available for use but the one selected for our purposes is the *Likert scale* because it’s designed to obtain people’s opinions, attitudes and positions on certain issues or conclusions. The scale is arranged so that the person is able to, “*strongly agree, agree, somewhat agree, somewhat disagree, disagree or strongly disagree.*” In this study an even-numbered scale was utilized so there would not be a “*no opinion*” or “*N/A*” as an option for the customer to choose from. It really is dependent on the nature of the questionnaire’s material, but in this case everyone is familiar and knowledgeable about the subject matter and will undoubtedly

have an opinion. It is very critical that the questions of the questionnaire focus directly on an issue, stated briefly and with clarity. Simple sentences with non-sophisticated and non-biased language are also beneficial. These simple guidelines were followed in creating the questionnaire used in this study which can be referred to in **Appendix A**.



### **3. Application of the Consumer Voice in determining a Successful Product**

#### **3.1 Introduction**

The ultimate objective of this study is to provide insight into future product needs, both currently met and unmet, of the Leading Edge Boomer group. The goal is to provide product planners and designers with the tangible attributes that would have a high potential to profoundly satisfy and delight the targeted demographic. Note that all data extracted by means of the customer voice applications from interviews and focus groups are based solely on certified LEB constituents. However, the logistics of focusing purely on the qualified LEB population for the questionnaire portion of the process became a very time-and-cost-intensive proposition. Therefore, the questionnaire administered was not restricted to target the specifically *qualified* LEB population exclusively. Instead, it was openly circulated to a diversity of candidates belonging to the general driving population, although all respondents were over the age of 25 and have some formal education beyond the high school level. Of the 131 respondents, only 46 were utilized in the study. The rationale of that decision is explained in Chapter 3 section 3.4. Edward Mcquarrie, author of *Customer Visits: Building a Better Market Focus*, substantiates the validity of customer importance clearly and concisely when he states,

*“In short, successful new products tend to be those backed by an early, substantial, diverse, and proficient customer research effort.”*

#### **3.2 Obtaining the Voice of the Customer**

As previously mentioned, this study is based on a methodology provided by Griffin and Hauser (1993) and intimately follows the approach presented by Burchill and Hepner-Brodie (1997) in the text, *Voices into Choices*. All selection of interviewees, preparation and conducting of interviews were done without any involvement on my part. My active participation began with viewing and transcribing the videotapes of the interviews. It is necessary to point out that the study has incorporated the use of both one-on-one and focus group interviewing formats. Further explanation is presented in the following sections.

### 3.2.1 Selecting Customers for the Interview

Congruous to the fact that this study focuses on the LEB population, a set of specific criteria were formulated and adhered to. Without stating all of the qualifications, what follows is a list of the most significant ones. Essentially, the same criteria were applied to the focus groups and to the one-on-one selection processes.

- Be between the ages of 45 and 55
- Annual household income of \$60,000+
- In the empty-nester stage: children away from home or 16+
- Have completed high school
- Describe themselves as generally willing to try new products
- Must have purchased a vehicle within the past 4 years
- Purchased their vehicle new
- Buy new vehicles at least every 7 years
- Be the primary decision maker in the purchase of the vehicle
- Have some unmet needs in their current vehicle
- Do not have financial restrictions as an impediment when purchasing the vehicle they want

### 3.2.2 Conducting the Interviews

It is worth noting that a slightly unorthodox practice was executed during the course of the initial stages of the study. Two different techniques of interviewing had been performed; the one-on-one format and focus groups. In this study, a total of nine complete interviewing sessions was selected as the means for providing the voice of the customers, seven were one-on-one and two were focus groups.

#### One-on-One Interviews

The one-on-one interviews were conducted in a rather traditional manner, were 90 minutes in length and involved open-ended questions that probed for information about past concerns, current considerations and future enhancements. The concept of the *ideal vehicle* was interjected several times throughout the interview to promote an innovative

mindset for the participants. It was important to keep them thinking about how the vehicle can better serve them presently and, eminently, in the future. The participants talked about the likes, dislikes and the met and unmet needs of their vehicles, and any responses that were too general were explored for greater detail and a clearer understanding. For example if they mentioned they wanted the ride to be comfortable, there were queries into the meaning of their definition of comfortable. Were they referring to the seats, the suspension, the legroom or something entirely different? This type of information is critical to extract. A slightly more alternative *imagery-based* form of information elicitation was integrated by showing the participants illustrations of two concept vehicles Ford is currently studying. The illustrations put a visual form to some of the ideas the participants had suggested. At this juncture, they were able to comment on any ideas, thoughts or images inspired by the illustrations.

### **Focus Group Interviews**

The focus groups had a very alternative approach, by automotive standards, by heavily favoring the ZMET approach. The rationale was to develop insight into consumers' fundamental values and experiences through imagery-evolved manifestations of memory and desire that are more future-focused. The process is thought to be a more motivating way to communicate new concepts linking consumers' values to product design. The focus groups were approximately 120 minutes in length with a group of six to eight people per session.

The participants were asked to bring with them three pictures or photographs that evoked positive imagery with respect to their depiction of what embodies an *ideal* vehicle. Every person was asked to relay the significance of each of his or her pictures. That is, how does the image relate to their ideal vehicle interpretations?

Prior to the focus group sessions, the participants were provided with a list of various statements that reflected feelings and beliefs. For example:

*"Being free and relaxed to enjoy the simple pleasures of life."*

*"Continue to be stimulated intellectually, mentally, and physically."*

*"Keeping close and connected to people I love."*

*"Personal freedom – exploring untapped potential and new possibilities."*

The participants were to individually select from a list all of the statements that held significant importance in their opinion. A tally was taken after all the selections were made and the two most popular statements were presented to the group. The participants were then asked about the importance of these two expressions in relation to their feelings and emotions.

The participants were then presented with a variety of pictures to be categorized into either a positive or negative feeling piles. The images were shown quite rapidly so the members of the group had to voice their individual opinions rather quickly. Only the positive images were used from that point forward. The participants then sorted the pictures into piles based on similarity. The individual groupings were then titled, and the most influential picture was agreed upon and placed on the top of the pile. Each group required a small discussion about the title significance and how the preferred pictures motivated the feelings and emotions experienced. The preferred pictures were then arranged in a collage arrangement and the participants were asked for an overall response of imagery portrayed in the collage. They were also asked to think about anything that should be included, but which up to this point, had not. That ensured nothing got left out because a picture didn't happen to evoke a particular emotion or idea.

A typical set of questions was pursued for a period of time, inquiring about likes and dislikes, their present vehicles, and comparisons to others on the market. Metaphorical language was used at several points to express an answer.

As before, the participants were asked to select self-important statements from a list that reflected "feelings I want from my new vehicle." A few examples are:

*"A view from a tall mountain top."*

*"Moving like a breeze-free and flowing."*

*"Oneness with the road."*

*"Beautiful horse thundering gracefully by."*

*"Sitting on my favorite chair with a remote control."*

The identical process was applied here as well by electing the two most popular expressions and discussing them.

At that point, pictures of various vehicle shapes in a black silhouette form were shown to the participants. This process was exercised in the same manner as the other picture flashcard scenario. The group members determined whether they liked or disliked the images and organized them accordingly. The numerous likes and dislikes were expanded upon through discussion.

A few open-ended questions involving past experiences that were unforgettable, such as, “the best drive ever” and “your most memorable vehicle.” The questions also delved in the area of vehicle personalities. For example, “If your ideal vehicle were a person, what would they be like?” and “If your vehicle was an animal, what animal would it be?” Queries inferring responses in the form of physical attributes did occur as well. Quality, vehicle and model comparisons, ideal vehicle expectancies, vehicle purchasing and the role of technology were the main topics of conversation.

At two separate instances the participants were asked whether they felt linkages existed. By linkage we are referring to a *relationship*, is there an inter-connection on an emotional, logical or physical level? They examined possible links between the individual sets of elected quotes and each of the quotes with the preferred pictures.

### **3.2.3 Transcribing the Interviews**

All of the interviews were videotaped and transcriptions were made from those recordings. I personally made four of the nine transcriptions and the other five were done professionally.

### **3.2.4 Identify and Group Key Customer Voices**

Identifying the VOC is typically performed as a team effort in order to eliminate the concern of missing important voices that may have been undetected by an individual. Each team member will review enough transcripts so that an overlapping effect is present. In this study, there was only one reviewer for each transcript.

This process requires reading the interview transcripts and highlighting any phrases, sentences or paragraphs that have relevance to the topic being researched. The significant statements are then copied onto cards without any editing performed except for words that add clarity, leaving the original sentiment unchanged. Each card was coded with the specific transcript and page number for ease of future reference.

The voices were then subjected to a sorting process in which they were segregated on the basis of similarity. It was important not to base the similarity on the statement language but rather on the theme it is attempting to portray. Upon completion of the sorting, there were a total of 38 natural groups that emerged, which were titled appropriately in accordance to its theme.

### **3.2.5 Constructing Customer Requirement Statements**

The first steps required the selection of 3 or 4 of the most representative statements from each of the 38 groupings and to place them at the top of their respective piles. The most representative statements were the ones that illustrated the group theme in the clearest and most descriptive manner.

Through the use of the translation worksheet, the customer requirements were constructed. The top 3 or 4 customer voices supported the development of a list of key ideas that expressed the overall theme they exemplified. From that point the customer requirement statement was constructed using the key ideas as the enabler. The guidelines cited in section 2.4.2.1.2 were followed during this procedure. The result, on completion of this stage, was 38 customer requirement statements identified for the ideal vehicle.

### **3.2.6 Affinity Diagram Technique - Assessing Requirement Priorities**

The rationale of this step is to reduce the large number of requirements to an amount that is more manageable. Refer to section 2.4.2.1.2 for a more detailed explanation of this procedure. As a result of this step, the 38 customer requirement statements were condensed to 14 *Level-1* requirement groupings. Ordering at an even higher level of abstraction allowed for 6 *Level-2* requirement groupings to emerge. Refer to the affinity diagrams illustrated in **Figures 3.3.1 - 3.3.6**.

### **3.2.7 Qualitative Analysis**

A detailed qualitative analysis of each requirement and its succeeding Level-1 and Level-2 titles were conducted to develop a clearer understanding. The analysis is presented in section 3.3.

### **3.3 Qualitative Analysis of the Voice of the Customer**

A total of six principal requirements were the result, once the final phases of grouping were completed. In no particular order of importance they are:

- 1) A multi-functional utility vehicle that proficiently manages all feasible road environments.
- 2) Ergonomic arrangements of anticipated luxurious appointments provide an ultimate riding experience.
- 3) Easy access to and from a vehicle with adaptability proficiencies that allow complete accommodation for all forms of cargo.
- 4) Affordable exciting pragmatic innovations.
- 5) Distinctively appealing vehicles will promote desired images by exciting the senses.
- 6) Absolute reliability in the areas of safety and endurance propagate confidence.

The following sections provide a deeper insight into the actual translation of customer requirements into the associated Level-1 and Level-2 categorizations. A brief description of the Level-2 title will be provided along with the affinity diagram. Also presented are several of the primary voices of the customers as extracted directly from the transcriptions, thus creating the group Level-1 title.

#### **3.3.1 Multi-Functional Utility and manages all Road Environments**

Interviewees revealed a general desire in having a vehicle that can cope with all of life's turbulence. Being able to go to work, take the kids to the soccer game, go out for a nice romantic night on the town and being able to go hunting on the weekend is what people expect the vehicles of today to handle. The customer thinks if one vehicle is capable of handling all of those things, then that's great. But it better be able to handle rain, snow, traffic jams and bumpy back roads, as well. See **Figure 3.3.1** for the affinity diagram for the mapping of the titles and requirements.

### 3.3.1.1 Powered for Broad-Ranged Utility and all Road Environments

#### “Attractive and Versatile Vehicles Combined with Luxury”

*“Ford has that larger, longer, five-foot bed, that's got some utility. And the overall size of the vehicle is not any longer than my extended cab. So I'd put together the Tahoe and pickup.”*

*“It [Lexus SUV] looked like it appeared that it would be just like a car getting in and out. That's what I liked about, it too, was it looked more like a luxury car than it did a big old suburban or SUV.”*

*“I like the way the Lexus SUV looks. It has a really sporty, nice appearance; and, you know, like the word sexy...If you can take that kind of look and get it into a van.”*

The customers were expressing a strong interest in the area of vehicle combinations. They were curious about the notion of combining an SUV with a pickup and delivering the SUVs and mini-vans with the ride, ergonomic comforts and amenities of a luxury sedan. The main issue is that they want functional utility but it needs to be disguised in an attractive manner.



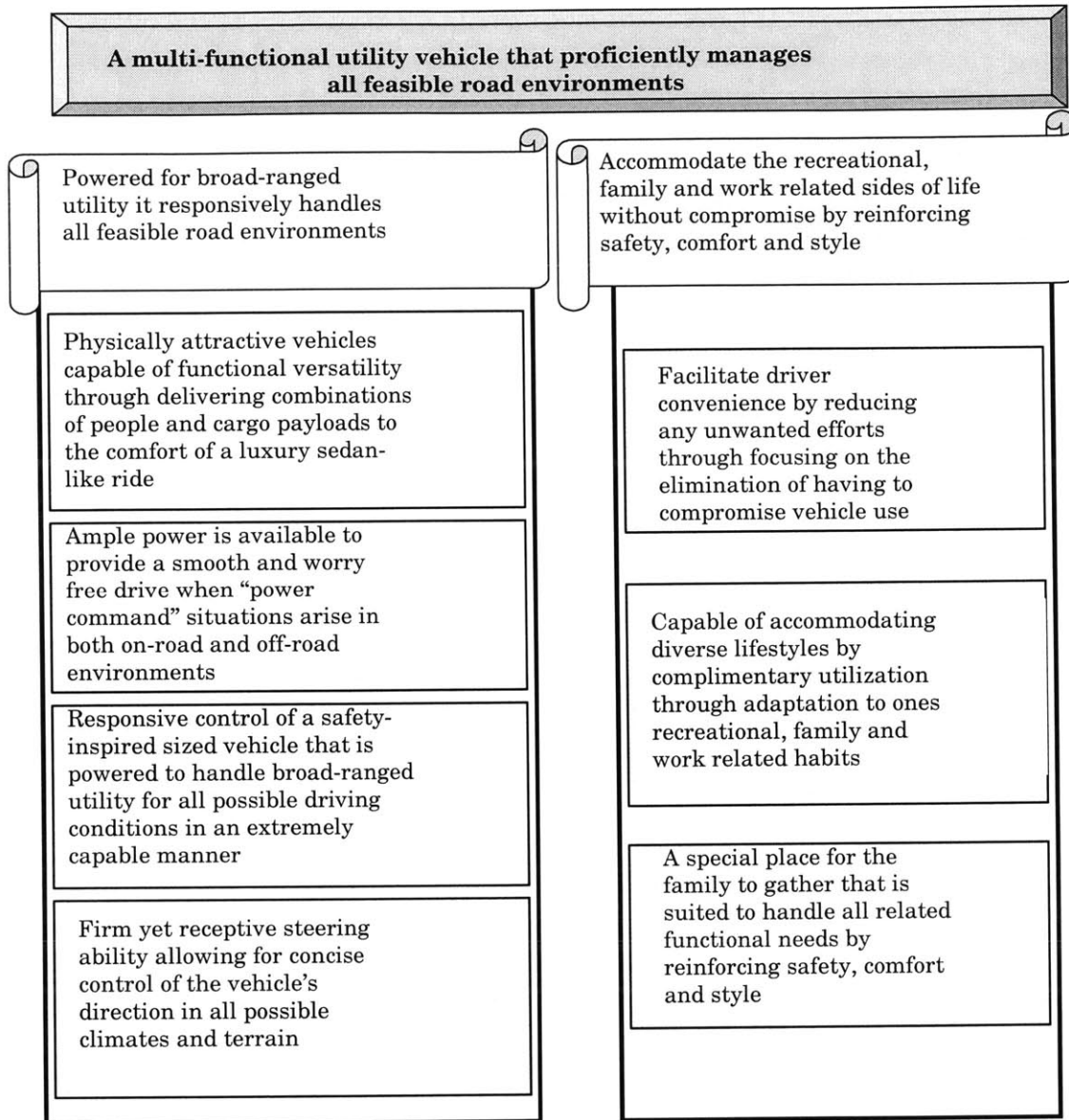


Figure 3.3. 1 – Affinity Diagram for Multi-Functional Utility and Management of all Road Environments

**“Ample Power for both On-Road and Off-Road Circumstances”**

*“It doesn't accelerate very fast. My husband's is one tap and you're half way down the road. Mine, you're lucky to make it onto the freeway.”*

*“Sometimes I pull a trailer, and I do like that power, particularly low in torque, you know, just pulling the dogs out of a muddy field or whatever.”*

*"It's the 24-valves...when you are on the expressway and you want to pass -- it's just so smooth. It picks up real nice. You know, it doesn't have any jolts in the car."*

People are quite concerned about having the power at their disposal in order for them to feel incontrol over their surroundings. On-road, they want to be able to react to the traffic and other unexpected incidents with smooth power, off-road they want the ability to haul, tow and get through rough terrain with ease.

### **"Responsive Control of a Capable Safety-Sized Vehicle"**

*"I want to feel very much in control while I am driving. I can start quickly if I have to. I can steer in and out of various situations."*

*"I don't feel as challenged [in an SUV] as I do when I'm in a smaller car because of your size they get out of the way."*

*"Do what I want when I want...That succinctly says it's capable. It can -- when the call comes in, it's ready."*

The bottom line here is that the customer wants a sense of confidence. As previously mentioned, they desire control over the vehicle and power is a great enabler of the control factor. The size of the SUV is typically quite intimidating and the drivers of those vehicles appreciate the experience of not being challenged by other drivers on the road. A capable vehicle is another means by which confidence is inspired in the customer. They know their vehicle will not fail regardless of the task ahead.

### **"Firm Steering with Concise Control in all Terrain and Climates"**

*"I wish I had 4WD instead of 2WD."*

*"Love the front-wheel drive. And you're not wobbling. A little touch, and you're where you want to be -- right in the middle of the road."*

*"It would have to steer easily...not necessarily a soft ride, but not too stiff a ride. And SUV's tend to be a little bit stiff and bumpy or like the big sedans, that are a little bit too soft."*

*"The front-wheel drive is much better in the snow than rear-wheel drive even with Traction Control option."*

Handling and maneuverability was another concern expressed by the customer. They were very centrally focused on the traction issue. Whether it was 4WD or FWD, the consumer, once again, wants complete and utter control over the car. The handling has to be considered, as well. The handling of an SUV and pickup are not highly admired, which is why many consumers have stated they want an SUV with a sedan-like drive.

### **3.3.1.2 Accommodate All Areas of Lifestyle without Compromise**

#### **"Facilitate Convenience by Reducing Unwanted Efforts and Compromise of Vehicle Use"**

*"I'm free to pursue whatever my various volunteers -- charity -- room for lunch -- it just gives me a lot of freedom."*

*"I like the convenience of that sliding door, getting in and out in parking lots. And even in my garage -- I like to park right next to the next vehicle -- I don't have to worry about the kids going BAM! in the car next to them."*

*"...hands-free type, voice-activated features of it...could have voice-activated Internet, e-mail, type things built in."*

*"The car is an accessory to my life and I want to enjoy it."*

Convenience may come in many facets. Some customers interpret it as not having to worry about your vehicle accomplishing the tasks you have planned for the day. It is related to vehicle functionality. The vehicle will help you do what you need to do. Certain characteristics of the vehicle may add to convenience, such as the sliding door. Reducing the amount of effort required while driving is also considered a convenience, e.g., hands-free or

voice-activated devices. The last quote truly captures it best by asserting the car is there to serve you, not the other way around.

### **“Accommodate Diversity through Adaptation to Related Lifestyles”**

*“I would probably continue to use two different vehicles; one for the work mode and one for the recreation.”*

*“I use my SUV for Scouts, hunting and fishing, going to see clients and running errands.”*

*“I could have gotten an SUV; but I got the thing that I wanted -- I mean, that I needed. So I didn't get what I personally wanted; I got what met my needs [minivan].”*

Vehicles must accommodate all aspects of life, which includes family, recreation, work, and life’s incidentals as stated by the second quote, above. It is still a common mindset to think that two vehicles are required to accommodate such a lifestyle. The last statement says the consumer had to compromise on their purchase. They had to settle for a vehicle because it suited their needs. They liked the luxury and status of the SUV but the convenience of the minivan outweighed this fact. It all ties back to adapting to all lifestyles, which, in this case, was a luxury minivan.

### **“A Special Place for the Family”**

*“Families are a part of my life.”*

*“...beautiful to look at, comfortable to be in, sharing it with someone you love.”*

*“...family-oriented because it can carry -- that's when I feel like we're having the highest and best use when we're using it for family-type things.”*

The first quote is very relevant because it applies to virtually everyone in some shape or form. People either have children, parents, grandparents or grandchildren in their lives to some degree, and it tends to be to larger extent. To most people, their family is the most important thing in their life and, quite often, they spend a great deal of time with them, and much of that time will involve traveling in a vehicle. Due to this rationale, customers believe

vehicles should exhibit a comfortable, safe and stylish atmosphere that delivers an adaptability to handle the family unit.

### **3.3.2 Ergonomic Anticipated Luxury for the Ultimate Ride**

Participants had very strong convictions regarding the vehicle's ability to anticipate the occupants' needs. They want to be soothed by means of luxurious amenities and incomparable comfort with adherence to ergonomic styling. The luxury spoke of in this respect impinges more so on the non-functional luxury. That is, luxury that spoils more than it provides a concrete purpose. Examples of non-functional luxury would be leather seats, wood embellishments, plush carpeting and the "J" style gear shifter (as on the Jaguar). Accentuated comfort provides the desired relaxing environment that the majority of customers profess as a necessity. See **Figure 3.3.2** for the affinity diagram for the mapping of the titles and requirements.

#### **3.3.2.1 Elegant Low Stress Ride that Induces Rejuvenation**

##### **"A Low Stress Ride in Comfortable Elegant Surroundings"**

*"It's so quiet. If you have the radio on, you have some nice soft music, you really feel relaxed in it."*

*"When you walk into the entrance of an elegant hotel, the feeling [special, trouble free] will start."*

*"...a Lincoln-like ride is very relaxing, less stressful...the ride seems shorter."*

There seems to be a correlation between elegance and relaxation in the consumer's thought pattern. In order to be relaxed in the vehicle the consumer must experience a pampered type sensation the moment they sit in the vehicle. As stated in the elegant hotel quote, that "special" feeling must embrace you instantly as you settle into your seat. Three particular characteristics seem to contribute immensely to the relaxation experience, a luxury-like ride, a very quiet interior cabin and a sound system that gives one the illusion of being at a concert. The quietness of the cabin was linked to the pleasant experience of listening to the stereo. To truly enjoy the music the interior must be very quiet. A couple of participants suggested very good tires to resolve road noise.

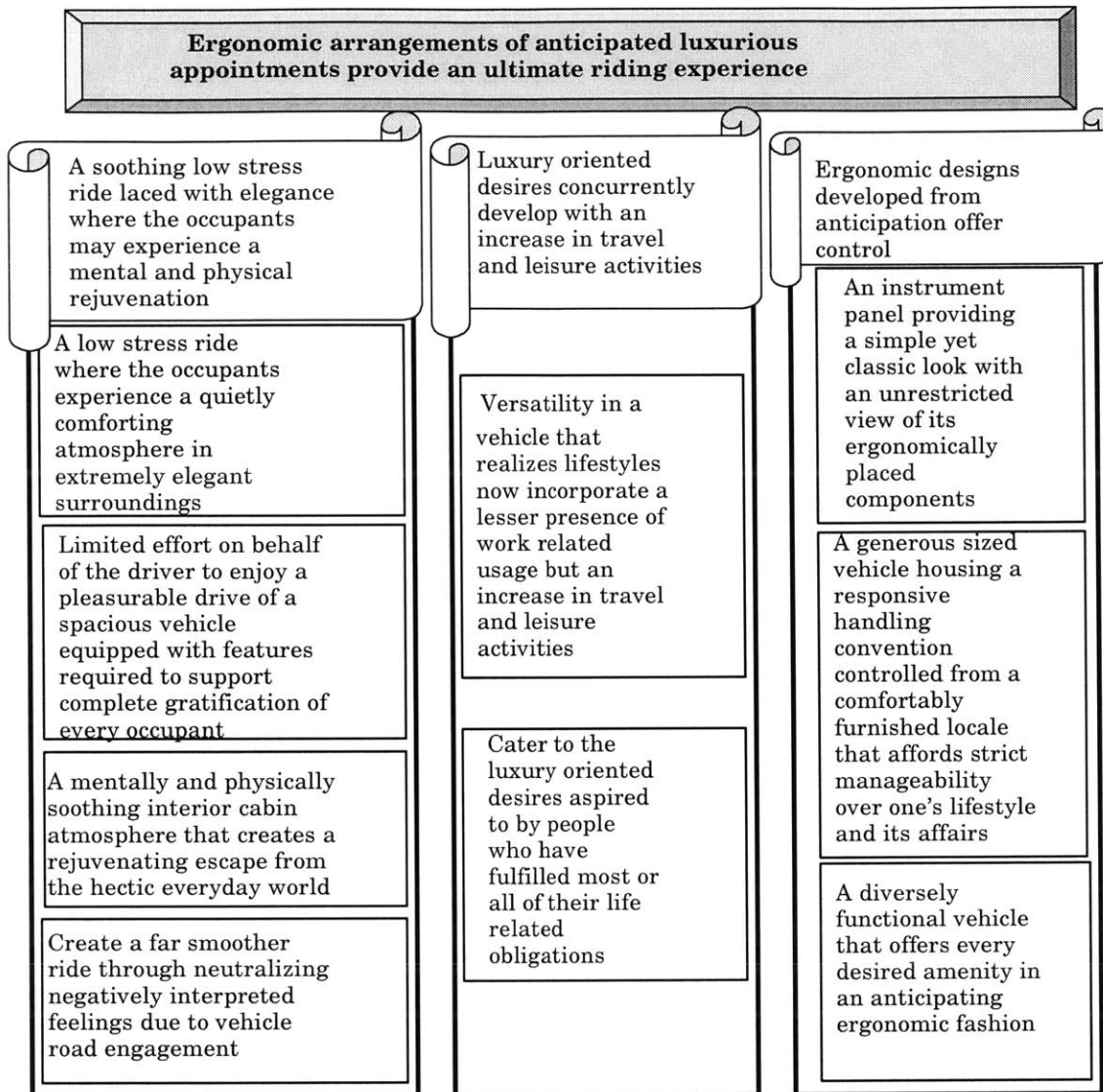


Figure 3.3. 2 – Affinity Diagram for Ergonomic Anticipated Luxury for the Ultimate Ride

**“Pleasurable Ride Made Effortless Supported by Overall Occupant Gratification”**

*“I would want to be minimally physically engaged. Because when I'm driving, I don't want to be doing a lot of work.”*

*“You can adjust them [the seats] just the way you want them.”*

*“[Ideal vehicle] smooth ride, very very comfortable, not being concerned for others in the car for their comfort and safety.”*

The expectation of comfort can be met by satisfying the customer through several of their senses and by reducing the effort required to drive the vehicle. Comfort may be accomplished in a physical sense, how plush and well-contoured the seats are. It may also be addressed with respect to the vehicle's attributes, how smooth the ride is that it delivers. Minimum physical interaction by the driver is another large factor in satisfying comfort expectations. Ergonomic styling is one method that will aid in minimizing the driver's interaction while driving. A mental form of comforting is also an issue for consumers. They are truly concerned for their passengers' comfort and safety.

### **“Creating an Escape from the Real World”**

*“My personal sanctuary. Because when I get in the house - -there's phones. There's distractions.”*

*“Personal sanctuary...not just the steel cage but also aesthetically pleasing, like to have a good sound system. They've improved the insulation on some of the SUVs now, that you can actually hear the radio pretty well.”*

*“It's my own little world where I can get rejuvenated from the real hectic world.”*

A large portion of the participants interviewed regard their vehicle as an *escape* from the everyday “rat race” of life. They have an opportunity to spend some time alone, sip a cup of coffee, listen to their favorite selection of music and forget about the day's problems. It may also breathe some life into the beginning of an otherwise rotten “Monday morning.” Regardless of the time of day, many people spend an extensive amount of time in their vehicles and they especially want that precious time to be “spent” in a worthy manner. Their simple request is to be provided with an attractive setting that offers comfort and relaxation.

### **“Create a Smoother Ride by Controlling Negatively Interpreted Road Engagement”**

*“I don't want to sacrifice the ride, because I do love the comfort of the ride of the Taurus. And obviously with the SUV, I thought it was too hard of a ride.”*

*“I wasn't real impressed with the ride. It felt like I knew I was in some form of a truck.”*

*“A smooth ride is defined by very good tires.”*

Providing a smooth ride is a highly admired characteristic. A smooth ride is typically attributed to a luxury sedan or at least the sedan vehicle model. Pickup trucks and SUVs are inherently labeled as “too bumpy” or “too rough” of a ride. Controlling the negatively interpreted feelings by consumers, especially with regard to truck models is remarkably important. The real concern is counteracting the preconceived notions about a truck’s “always rough” ride. A point worth noting is the theories consumers had about the role of the tires on the vehicle. On several occasions, participants said they wanted to see “very good” or “very large” tires on their vehicles to help combat rough rides and noise issues.

### **3.3.2.2 Luxury Oriented Desires in Concurrence with Travel and Leisure Activities**

#### **“Versatility for Greater Presence of Travel and Leisure Activity”**

*“Other than a little more leisure time, I don't see much of a change in that regard. I can't envision myself not working.”*

*“We like to travel. It's hard now. Our kids are getting to the age where we can do it again.”*

*“She is involved in a lot of charity activities and does a lot of work with disadvantaged kids and education, yet at the same time, she gets to do a lot of fun stuff. Her life is interesting and she travels.”*

It’s quite obvious that as people approach the LEB stage in their life they are either retired or looking at the possibility of retiring within the next 5 to 10 years. Many of the interview participants stated that they would continue to work for many more years, just in a more limited capacity. As schedules open up after retirement much of it is filled with traveling, volunteer work and leisure time. Essentially, consumers must consider the more frequent travelling and leisure uses of the vehicle but not neglect the work aspect. They realize that some of the allotted free time will involve visiting family and family related events, weekend trips, fishing through the week, and so on.

#### **“Satisfy the Luxury Oriented Desires of the Deserving”**

*“Well, I deserve it. I want it. That's it. Because it's my reward. But I don't think I'll do it while they're still at home. It'll be my reward when they're gone.”*



*"I go more for the luxury because I'm not putting in the car seats and hockey bags. I'm not hauling ten Girl Scouts around. I don't worry about the kids spilling anything."*

*"Obligations are fulfilled, so luxuries are more accessible."*

Another common theme with the LEB group at this stage is their realization that the majority, if not all, of their commitments and obligations are fulfilled and they are ready to treat themselves to something special. When the concept of a *Reward* vehicle was mentioned to the participants, they didn't appear to agree with the ideology of an expensive car that is appropriate for nothing else than a leisurely drive. The connotation of "Reward" gives it the appearance that it will not have any true functionality. The consumer is ready to buy that special vehicle, but not at the expense of functionality.

### **3.3.2.3 Control through Ergonomics and Anticipation**

#### **"Simple and Classic Instrument Panel with Unrestricted Views and Ergonomic Styling"**

*"The interior appointments. The appearance of the dashboard -- would be kind of recessed. The dashboard light -- not glaring. Digital odometer. I would want dials or meters for the speedometer."*

*"Computerized is fine but I don't want to see it all over my dashboard, it gets to distracting. It removes from the simple beauty of the vehicle."*

*"[SUV] can see everything at a glance without searching for it."*

It was clear from the customer voices that the expectations of the instrument panel (IP) are fairly innocuous. Utilize a more classic than contemporary design and refrain from cluttering it with technical gadgetry. Simple, flowing lines are also preferred for the sculpting. Ergonomic styling should be applied to appropriately locate controls, gauges and other relevant details so they may be easily reached and viewed regardless of seat position.

### **“Offer Control through Vehicle Size, Handling and Comfort”**

*“And this vehicle has a lot of capability; it can do lots of things and it can do a lot of things well.”*

*“That what you really have in life is really a certain amount of time and however you decide to spend it, if you can control that, that's where you get the most out.”*

*“Well, being a little heavier, larger. You have all these people out there with these F150s and 250 trucks that aren't for work. They're using them for driving, and they want to intimidate you.”*

*“Being uncomfortable makes it difficult to maintain control.”*

Consumers want to take charge of their lives. They realize life is short and they don't want to waste time worrying about trivial matters. A vehicle should afford them the opportunity to get things done regardless of their nature. Issues over control on the road bring about another focal point. Concerns about the intimidation-factor from other large (SUV or pickup) vehicles are high. They feel as though they need to compete with similar-sized vehicles in order to maintain a sense of control over the road and their own well being. In conjunction with size, comfort is another distinction that affords control because it's as simple as the last quote states; the more comfortable you are in the vehicle the easier it is to control.

### **“Anticipate Diverse Functionality by way of Individually Focused Amenities”**

*“...comfortable steering wheel - able to come to my level.”*

*“I think in most cars usually the same person only drives, and the same person for passenger; but we switch a lot.”*

*“I like the sliding doors part...don't realize it until you're in tight parking space and everyone's piling in and out.”*

*“I love the electronic seat, I like the up-and-down where I can raise my height up. I don't need to put a pillow to sit on. You could have it adjusted - like those adjustable beds - right exactly where you want it.”*

Individually focused amenities can be coupled with comfort, convenience, utility, ergonomics, etc. The vehicle must have the flexibility in design to suit any potential driver in the most optimal manner. The steering wheels and seats should be able to suit a person who is 6'8" and one who is 5'2". As stated in the second quote, many families will share the use of vehicles and, if that is true, then a case may be built for addressing those issues. Not only are common adjustable characteristics, like seats and steering wheels, a way of tailoring a vehicle to an individual, but consider other details that may be adjustable to accommodate them better. What about gauges, sections of the instrument panel or the center console? Vehicle abilities are another form of catering to needs. Refer to the sliding door statement: Some people find those doors much easier to use. Can they be implemented elsewhere, other than minivans?

### **3.3.3 Easily Accessible, Adaptable & Accommodating**

Many concerns were voiced regarding the ease of entering and exiting the higher vehicles, such as the SUVs and pickups. It was classified as awkward, difficult and ineffective. The vehicle must offer easy modification to allow for a more accommodating capacity. See **Figure 3.3.3** for the affinity diagram for the mapping of the titles and requirements.

**Easy access to and from a vehicle with adaptability proficiencies that allow complete accommodation for all forms of cargo**

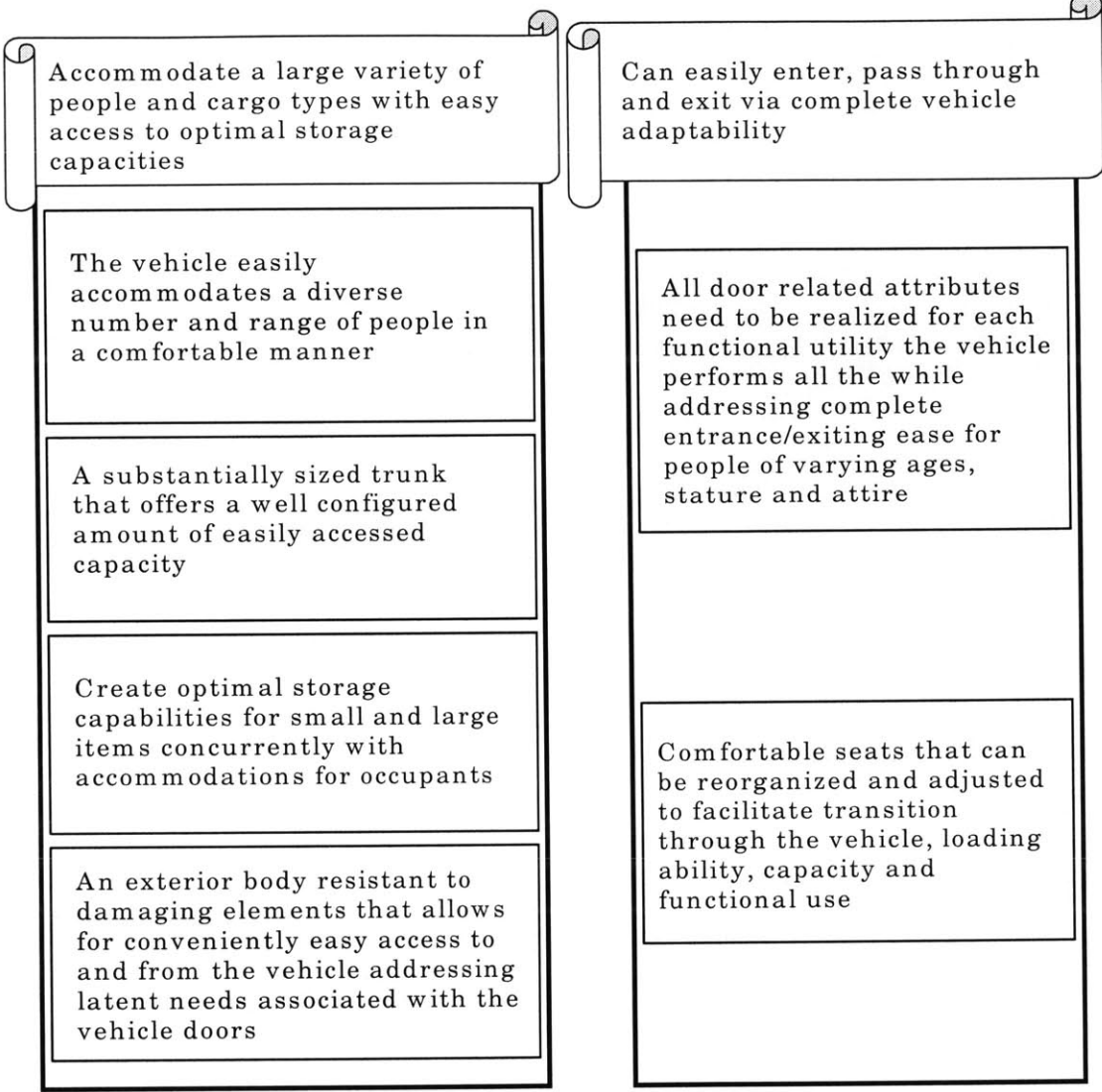


Figure 3.3. 3 – Affinity Diagram for Easily Accessible, Adaptable and Accommodating Vehicles

**3.3.3.1 Easy Access with Optimal Accommodations and Capacities**

**“Easily Accommodates Diverse Number and Range of People”**

*“If we had one person visit, we’d have to take two vehicles -- with a family of five.”*

*“I want to know the passengers will be comfortable and they’ll enjoy riding in my car.”*

*“My friend is 6'5” and sits in the back sometimes and in the small cars I've had he's got no leg room, he's cramped.”*

These vehicles may be faced with the task of carrying a diversity of people from grandchildren to grandparents. There will undoubtedly be occasions where friends or the children's friends are along for a ride. As stated in the first quote when a sixth passenger is added, there is a concern about capacity. Again, this would be a trivial matter the consumer does not want to worry about. The vehicle must be able to accommodate larger groups of people. The passengers have been linked to comfort considerations in previous sections. This simply reiterates it once again, the consumer wants to ensure the passengers, typically family and friends, are treated to an extremely comfortable and enjoyable ride. With regard to the diversity issue, design considerations must be considered for ranges of size and age.

#### **“Easily Accessed Optimal Capacity Trunk”**

*“And I'm also a soccer coach, and I always have a lot of soccer balls kicking around in the back of the trunk along with other miscellaneous items. It allows me to carry those and put my golf clubs in. It was important to me that it had a trunk that I didn't have to be moving stuff in and out of all the time.”*

*“...so many times you stick things up inside there, and the trunks are so deep now, that you would almost have to crawl in to get it.”*

*“He carries a lot of materials with him because he makes booklets and everything for the conferences and tapes and everything. So he needs more trunk space.”*

A typical desire for most sedan owners is larger trunk space. However, the second statement raises an important issue. Larger trunks are fine, but consider who is putting the item(s) in there and how much it may weigh. Picture a 5'3” woman who is 55 years old trying to get a heavy case of pop out of a very deep trunk. Consider the ergonomic issues. The first quote relates to the consumer once again not wanting to be affected by trivial matters. Everyone leads busy lives and the vehicle is used for work, school, extra-curricular activities, running errands, travel, etc. The inconvenience of continually loading and unloading a car, as

different events arise, can be overwhelming. This could be viewed, perhaps, as another problem requiring the application of a combination vehicle.

### **“Optimal Holding Capabilities for a Variety of Items and Occupants”**

*“And carrying golf clubs in the back of the Tahoe, it's great for that. But at the same time now I can take her friends.”*

*“The minivans are just a little too small I think for our utility interior-wise. Maybe not so much the people part of it, but the cargo area, behind that second row of seats.”*

*“The setup for the rear space in the SUV really has too many things sticking out into it to be able to pack it reasonably well. We used to have a station wagon that I could pack better than that SUV.”*

*“I want room to put my purse if I have a passenger, otherwise it goes in the back.”*

The customer voiced the *loadability* of the vehicle very strongly. They counted upon being able to load people and various items easily and comfortably. One quote specifies the delight in being able to throw his golf clubs in the back, yet still have plenty of room to accommodate his daughter and friend. The question remains as to whether or not he could easily fit another set of golf clubs in the rear of his Tahoe (SUV). The second statement voices an opinion that in minivans there is typically not enough storage room behind the last seat. Additional points of view also criticize the optimization of the storage capacity by implying that too many obstacles are present within the vehicle's interior area to efficiently load it. The assumption is that this is made in reference to items such as the tire wells, sidewall storage pockets and the like. One consumer even stated that he would be willing to trade off the cubbyhole storage pockets for more interior space. Perhaps removable or collapsible storage pockets can be explored. One lady voiced concern over the lack of storage space in the front section of the interior cabin. She feels the need to have a spot where her purse can be stored in the front when she has a passenger. She raised issues with the center console and its removal or relocation. Perhaps a similar suggestion can be applied, as previously mentioned, to look at the potential of a removable, collapsible or a height-adjustable console.

## **“Exterior Body that Resists Element Damage and Door Enhancements for Vehicle Accessibility”**

*“Tough...exterior is going to be a good paint, that will take a little bit of a beating without denting too badly, or scratching too badly.”*

*“Slide-out trunk tray, extra wide opening for the deck rear.”*

*“The tailgate, the one I've got, you can get them with the panel doors that open like this or you can get them with the tailgate. And if you want to have a tailgate party, you can't have one that opens like that.”*

*“The kids have a hard time with the sliding doors, so I always have to be the one who walks around and shuts the doors, no matter what we're doing.”*

Since the vehicle is foreseen as multi-functional it ought to be able to travel the back roads to your favorite fishing hole than take you out for a night on the town. The consumer shows anxiety from the abuse that back-road traveling inflicts on the exterior of the vehicle's body. Eliminating the chipping, scratching and denting on the exterior would be a major delight. The customer is also very enticed by the rear doors of the SUV, station wagon and minivan vehicles. Accommodations allowing easy access and loading/unloading can be offered through larger entranceways or wider-opening doors. In addition, the ability to perform tailgating type functions are ranked as quite important. Designing the rear door to open in different ways affords the consumer a choice dependent on the situation. Dissatisfaction was also voiced with regard to the difficulty incurred when having children try to close the large sliding doors. Is there a greater need for automatic sliding doors? Can the effort required be lowered? Can they be split to make them smaller? The concept of the sliding door was praised as a convenience for loading cargo and people alike. The functionality of the sliding door in restricted locations (parking spaces, garages) also showed signs of convenience and ease. Should we assess further utilization of the sliding door?

### 3.3.3.2 Easily Entered and Exited Allowing Greater Mobility Inside

#### **“Realize Ingress and Egress Issues Concurrently with Door Related Attributes to Functionality”**

*“If we take our older parents -- I'm trying to get out of the back seat of that van, in a very nice dress and heels, and nobody does that.”*

*“My pickup is only a three-door; and you know they're making them four-door now. So this is a real four-door. This is not a scaled-down type thing. This is what I really needed.”*

*“When I tried to get in and out of it -- I couldn't figure which leg first, or how to get myself off of it.”*

*“I like the open concept - easier for older or bigger people to get in and out of. It also makes it more functional.”*

The LEB consumer is overwhelmed by certain vehicles due to the terrible access provided, SUVs, minivans and pickups are either too high off the ground or the back seat is extremely awkward to enter and exit. They find that their parents and they, themselves, have difficulty with ingress and egress from the vehicle. The height of the doorway is one of the main obstacles and the other involves the poor passageway to the rear seat. It is apparent that not only does stature and age have to be considered in addressing these issues, attire must be included jointly. The third quote brings to light a unique concern, the confusion of how to appropriately enter the heightened vehicle. The height issue is difficult to assess because there is a large conflict of interest. The consumer is very fond of the height with respect to safety, vision and off-road clearance. The issue must be addressed but not at the expense of the vehicle's height. The doors play a vital role in the functional ability of the vehicle as stated by the final voice. It could contribute to easier access to the vehicle simply by opening further or being larger. Increased accessibility will slightly expand the vehicle's functional capabilities. The pickup truck consumers greatly appreciate the added access provided by the third and fourth door options. It appears as though the more access they have to the vehicle the more content they are. This is exactly why greater attention should be paid to the door's role in vehicle functionality.



### **“Facilitate Greater Vehicle Utility through Adaptable Seat Positioning”**

*“You can turn the two seats around in the middle, so they can have three in the back, all seatbelted in, and then the two here; it's like a little community.”*

*“Fold flat rear seats...that's a good thing.”*

*“...the one [minivan] that both doors open -- you can see in through either side of it. It's very inconvenient to have to crawl over everything to get out the one door.”*

Physically re-configuring the seat positions in the vehicle was very exciting to the consumers. It offered accommodating abilities in addition to expanding the utility of the vehicle. Creating a more open environment within the vehicle was another condition where they exhibited an interest. The second quote reiterates a point voiced by many of the participants: Allow the rear seat to fold completely flat in order to facilitate easier loading, greater capacities and comfortable sleeping quarters.

#### **3.3.4 Exciting Pragmatic Innovations**

Advancements in the area of communications related to business, the vehicle and personal uses are well received but there is also partiality to creating greater efficiencies for the vehicle. The coupling of the two concepts creates a common idea that innovations that are new and exciting are very welcomed but there needs to be a balance between exciting and practical. The pragmatic innovations not only aid in appeasing the mindset of the consumer in justifying added cost associated with increased innovation but it presents a discernable vehicle value creation. The LEB group is willing to spend more money than other consumer segments but they expect value for that money. See **Figure 3.3.4** for the affinity diagram for the mapping of the titles and requirements.

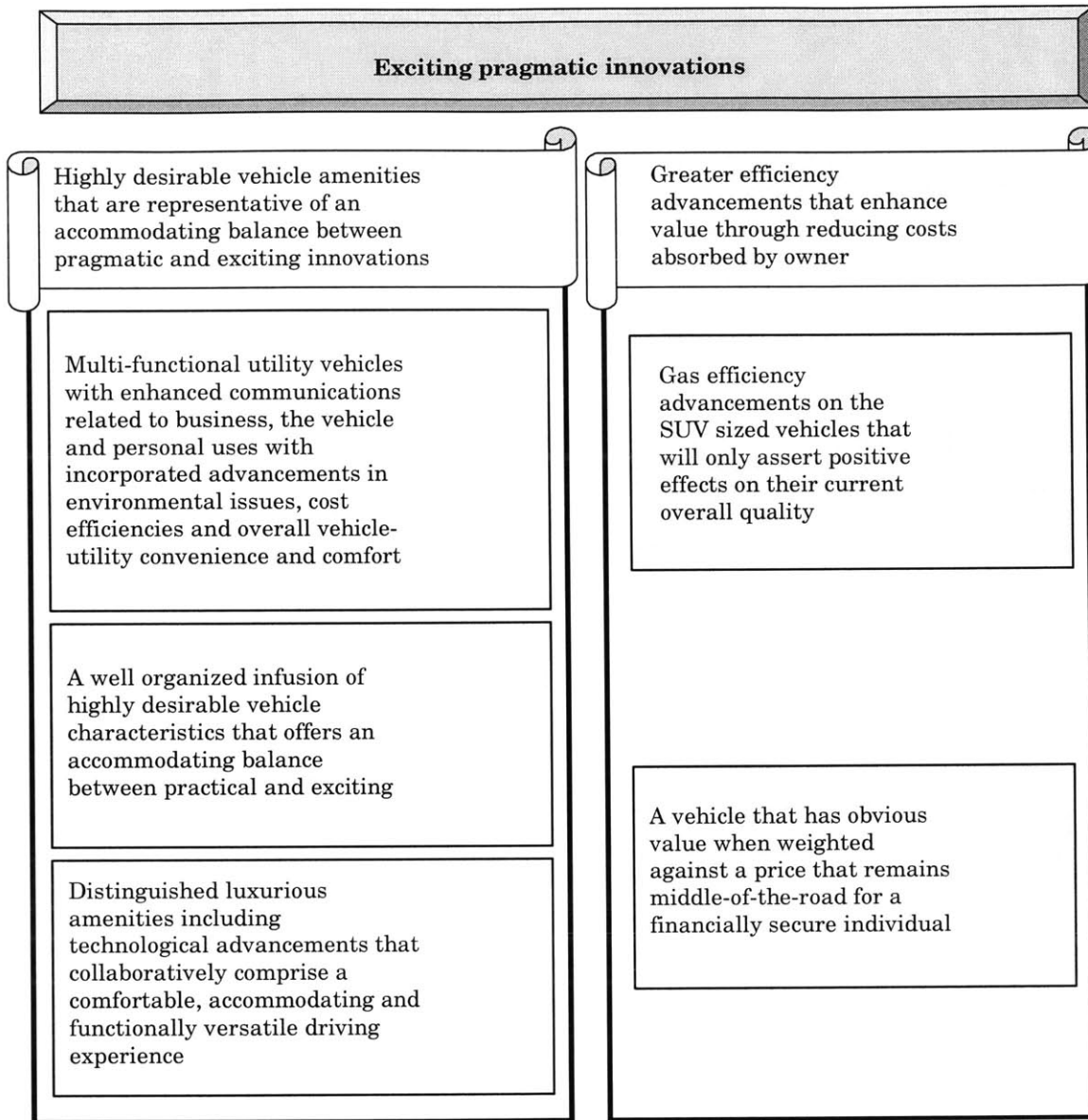


Figure 3.3. 4 – Affinity Diagram for Exciting Pragmatic Innovations

### 3.3.4.1 Desirable Amenities and Balanced Innovating

#### “Enhanced Innovation in Technology, Efficiency and Utility”

*“That’s why I want a luxury van!...I want one, and they just don’t make one.”*

*“It’s [SUV] just not as convenient as a van. You know, where you can walk through it.”*

*"I'd like to see a better maintenance schedule. Volvo and Honda have set maintenance schedules at specific mileage with cost associated."*

*"...communication for my needs, business-wise."*

*"The car should talk to us, like where you're going, safety issues, road conditions/hazards, whether maintenance is required."*

Innovation in utility reared itself in the text of numerous customer voices. Cross-vehicle concepts had arisen numerous times with the attributes of capacity and luxury being just two of the forerunners. The selected quotes target both of those areas. The first one illustrates the desire to have a luxury classification of minivan. A Lincoln or Lexus minivan would be a reasonable comparison. The other concept is an SUV styled in the interior similar to a minivan, that is, to provide the interior openness and accessibility offered by a minivan with the strength, luxury, styling and image of an SUV. That may even suggest putting sliding doors on an SUV. The technology portion was centered on the communication aspect. Note that the interpretation of communication must be taken in the context of business, personal and the vehicle itself. On a business level they make reference to fax, e-mail, laptop and Internet connections. The personal equivalence would include personal forms of e-mail, a built-in pager, hands-free cell phones, updates on road conditions, GPS, and so on. The authentically unique level is the vehicle application. People exhibit a need to have an interface with the vehicle on a maintenance level. People express a desire to have the vehicle inform them when it requires any form of maintenance, be it scheduled or unscheduled. A vehicle that is capable of tracking its own maintenance requirements stands to not only prolong the life of the vehicle but also provides safety, peace-of-mind and convenience to the consumer.

#### **"Practical and Exciting Infusion of Desirable Characteristics"**

*"[Ideal vehicle] take the best of Five different vehicles into one...quality of leather, size of engine, looks and lines are sleek and sexy, comfortable seats, safe, durable and good visibility."*

*"...progressive actions in creature comforts like cell phones, TVs, individual sound systems, etc."*

*“I would hope that it would be enduring and family, but also exclusive, luxurious and sophisticated, I don't think I could ever make a van look sexy.”*

This category tends to speak more on a *personality* level of the vehicle; consumers are definitely captivated by personality. Many of the traits we look for in a vehicle would be similar to those possessed by someone we admire, or perhaps a very good friend. Examples would be strong character, attractive looks, easy to be with, dependable, supportive, respectable and good-natured. Refer to the first quote. It speaks of size of engine, sleek and sexy lines, comfort, etc. Things may be a little boring if they aren't mixed with a little excitement, so items like the creature comforts and luxuries mentioned in the second and third quotes are capable of creating that feeling. The exciting characteristics will be the ones that delight the consumer in a “fun” way but they do realize that practicality has to be part of the equation. In a newly designed vehicle, cost efficiencies must be progressive, illustrate a continued effort in finding new solutions that react to or resolve environmental issues, aggressively address safety advancements, etc.

#### **“Distinctive Luxurious Amenities Contributing to Functionality”**

*“...mode of transportation that serves my needs, extra curricular needs and it does it in luxury.”*

*“Luxurious...It's got to have a great sound system with comfortable seats...and an interior that can be cleaned easily.”*

*“Want technological advancements visible in the higher-end cars. If LS has dimmer lights and Neon does too...big deal then.”*

Functional luxury is a connotation that may be interpreted in different ways as represented by the quotes. The first quote stresses the fact that the vehicle is an accessory and must be functionally versatile. They are essentially saying, “I want luxury but don't let it impede my use of the vehicle.” The second quote is related to the first one by illustrating a desire for luxury, but also a need for the vehicle to be easily cleaned. That implies the vehicle interior is functional because it can be cleaned easily and look new after performing the necessary function required by the consumer. The last quote doesn't necessarily define what

luxury is but it states what it definitely is not. If a particular feature is seen on a lower end vehicle then it is not classified as a luxury item. An item must be distinctive to the upper classification of vehicles in order to be considered a true luxury amenity.

#### **3.3.4.2 Greater Efficiency Advancements Enhancing Value**

##### **“Gas Efficiency Advancements without Negative Effects”**

*“And I know that with this gas -- it's a lot. And since I'm always looking for a little better gas mileage -- but not what it will take away from the quality of the car.”*

*“Gas is cheaper for a diesel.”*

*“Gas mileage is a biggy right now, that's what holds us off from buying one [SUV].”*

This set of voices is self-explanatory. The consumer is not impressed with the gas mileage currently being exhibited by the larger vehicles, mainly SUV and pickups. The first statement brings to light a very relevant point. The fuel issue needs to be addressed, but not with a solution that degrades the quality of the vehicle. Perhaps there needs to be a stronger consideration for diesel as an alternative fuel. It is definitely a cheaper means of fueling the vehicle. There were a few consumers who alluded to the fact that they did not buy a gas-inefficient vehicle, namely an SUV, solely because of their purported negative effects on the environment.

##### **“Financially Secure but still want Value for the Money”**

*“The price difference of a van to SUV in comparison to benefits was not that much.”*

*“I expect us to be financially secure and my kids are doing well.”*

*“I actually don't like those cross vehicles too much...The crossed ones are so expensive that I wouldn't want to take them off-the-road and take a chance of injuring it.”*

The majority of the LEB group said they were financially stable at this point, or at least expect to be in 5 to 10 years, when they consider retiring. The SUVs were clearly voiced as being fairly expensive. A couple of participants also viewed the cross-vehicle selections as being costly. The rationale here is the vehicle loses value because one is unlikely to use it for a utility vehicle where there is fear of damaging it.

### **3.3.5 Distinctive Designs Promote Desired Images and Excite Senses**

Consumers demonstrated a strong passion with regard to the styling of the vehicle. “Very distinct appeal” was voiced in many instances. They were apathetic toward the *run-of-the-mill* styled vehicles. They crave something new, different and exciting. It needs to stir the emotions inside and stimulate the senses. See **Figure 3.3.5** for the affinity diagram for the mapping of the titles and requirements.

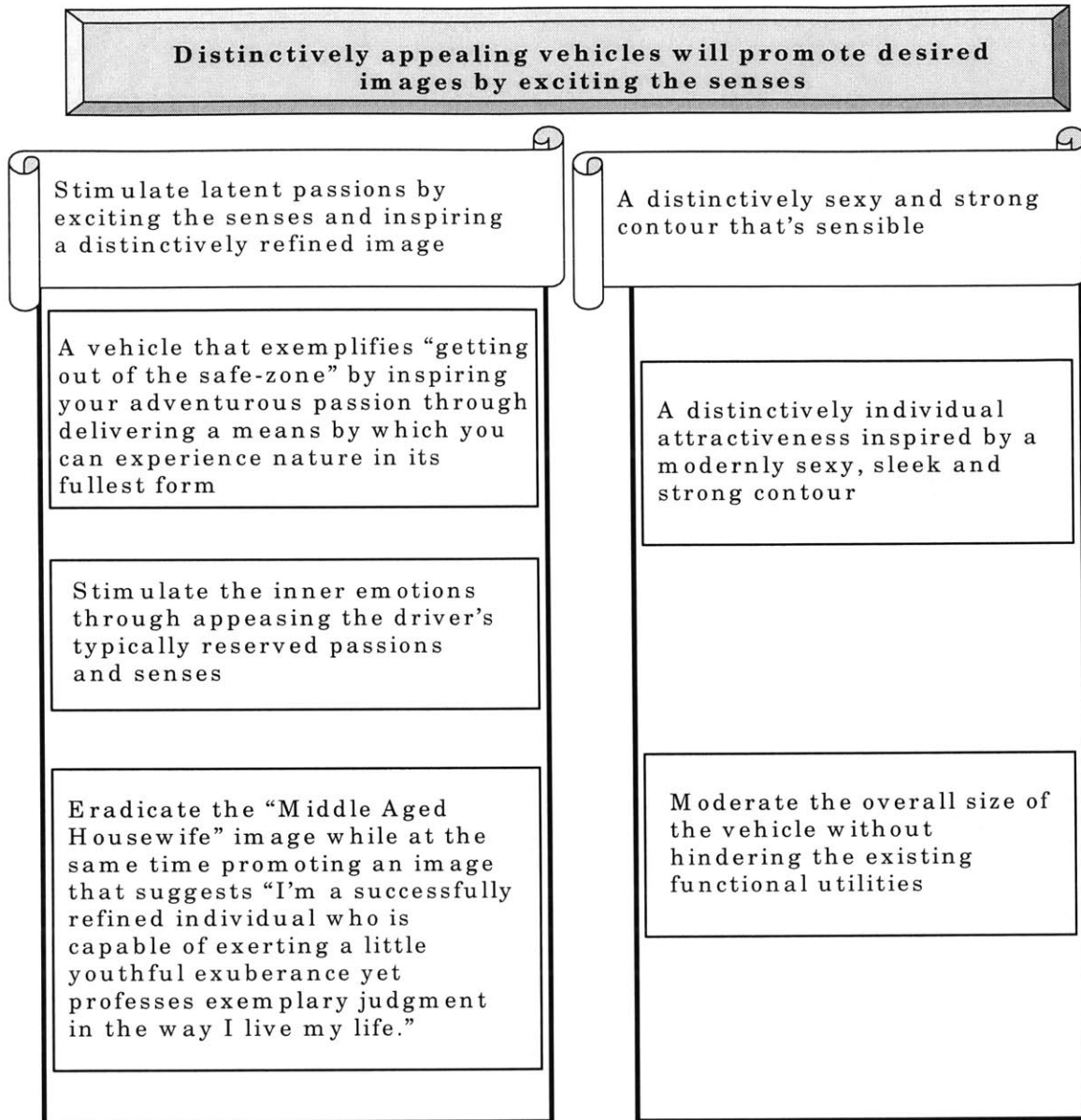


Figure 3.3. 5 – Affinity Diagram for Distinctive Designs Promote Desired Images and Excite Senses

### 3.3.5.1 Stimulate Passions and Images by Exciting the Senses

#### “Inspire Adventurous Passion by Delivering the Experience”

*“...it projects an image like you're going to get in and take off to the beach or to the mountains.”*

*“Adventurous -- yes, when the roads are bad, it's an adventure just getting in their [ranch] sometimes. You don't even want to go with just one four-wheel drive sometimes, when it really rains.”*

*“...getting out of the safe-zone, free, different experiences, being individual, and taking chances.”*

Adventure seems to commonly be coupled with driving the back-roads, or going to the mountains, but it symbolizes much more. As the first quote illustrates, it’s an image that says “you can do anything” and “I’m spontaneous.” This image is projected from vehicles with multi-capabilities. This may be classified as “doing adventure.” You do things because you can. In other situations, adventure is emotionally felt, as in the case with the second quote. In their case accomplishing the trip to the ranch in bad weather was exciting, daring and intensive, like a *high*. Classify that as “feeling adventure.” The third quote incorporates adventure through different experiences. Breaking away from the everyday routine and trying something new. This is “experiencing adventure.” The inspiration must be designed into the vehicle. That is, the consumer can only do, feel and experience these things if the vehicle allows them to.

#### **“Stimulate Emotions by Appeasing Senses and Latent Passions”**

*“You feel good in there [car] and you ‘want’ to be in there.”*

*“She’s having fun, that’s how I want to feel driving a car...like feeling power and handling.”*

*“When blasting the CD I feel like I could dance in the car.”*

*“A Lincoln ride in an SUV makes driving more fun instead of going from point A to point B.”*

First and foremost, the vehicle has to be designed so that the consumer *wants* to be in there. They associate being in the vehicle with a *great* feeling. Wanting to be in the vehicle correlates back to many of the previously mentioned features, functions, attributes and means of delighting the customer. The consumer, although not young in age, is young at heart and desires fun and excitement to be part of the driving experience. The vehicle’s attributes and capabilities enhance fun and excitement. A powerful, tight handling vehicle can invigorate the physical senses, listening to your favorite tunes loud and crystal clear can stir some old memories and emotions and remind you of great times. The last quote is basically saying that if you make the ride enjoyable the driving won’t feel like work, like a



chore. That is definitely one emotion we do not want our consumer to experience in the vehicle.

**“Eradicate the Housewife Image and Boast a Successful Positive Image”**

*“I don't like taking my clients to somewhere in something that has a trailer hitch on it, you know, from taking my boat. It doesn't project the image that I'm a professional, someone who exercises good sense and uses good judgment.”*

*“Nothing ostentatious but...something short of flashy but -- impressive.”*

*“He said, ‘Mom, we cannot buy that [SUV]. It is not good for our world.’”*

*“That was the biggest negative, you know. I told my husband, ‘If I get that [minivan], Don, I'll become a middle-aged housewife.’”*

Presenting a negative image is a definite taboo in the LEB group. The “middle-aged housewife” is a branding with which the minivan gets labeled. It's obviously has a negative connotation associated with the stereotypical mother dragging the kids to school, the doctor's office or soccer practice in the van. Some suggested a Luxury minivan would eliminate that stigma. Consumers also fear portraying the non-professional image in the presence of co-workers. Their vehicle must emit a professional image, which typically means driving a sedan. Vehicles with dirt in the back or trailer hitches or scratches all over the exterior do not adapt very well in a professional atmosphere. If there is any chance in developing a multi-functional vehicle that will incorporate leisure, family and professional lifestyles this scenario must be addressed. Several of the consumers had also mentioned of the despicable rapport SUVs and large trucks have with people who are very *environmentally* minded. Certain participants stated even their children were telling them not to buy an SUV because of the detriment to the environment. The third quote is an actual quote of the participant's child. Finally, although luxury is something desired by the majority of consumers, the LEBs welcome luxury and all its amenities but they don't want to appear to be pretentious or pompous. In other words, the vehicle must present itself in a very refined manner.

### 3.3.5.2 Distinctively Sexy and Strong Contour

#### **“Distinctively Individual and Attractive”**

*“Cars nowadays look run-of-the-mill, they all kind of look the same.”*

*“I like a distinctive car, when you see it you want to see it again.”*

*“The car must attract me before I say, ‘Yes I want it.’”*

*“Outside has strong visual look, not like a tank though, it's sleek, strong and streamlined.”*

The LEB group unequivocally had a heightened enthusiasm when questioned about the exterior styling of the vehicle. They accentuated the need for *distinction* from the rest of the vehicles currently on the market. They believe most vehicles nowadays look too much like one another. They confess that a vehicle's looks must “jump out” at them, they want the styling to be so unique that it makes them look a second time. Being distinct alone is not enough; it must also be attractive. Long, sleek, sexy, curvy, strong, streamlined, rounded, smooth and modern are a few of the adjectives used by the consumer on their recommendations for body contours. Rounded styling was very popular while anything boxy was considered unattractive. They wanted a sense of strength presented in the design but not have it looking like a tank. *Strong* should be viewed in a design sense as “sturdy” or “protective” with even a little “power” combined in the image.

#### **“Moderate Overall Vehicle Size without Hindering Utility”**

*“Friends who have some of those bigger things -- like the Expeditions or the ones bigger than that -- and they can't fit them in their garages.”*

*“I think because it is so big, to me [female] it's very intimidating, the power.”*

*“I think the SUV is more manly, it's more of a guy car.”*

*“[Concept Car] I'd just say that it looks more like a limousine than an eight-passenger vehicle.”*

“Bigger is better” is not always the case. Granted, the LEBs did mention they wanted a decently sized vehicle for capacity, safety and comfort reasons, but there must be a limit to the size. When the trucks are too large to fit in their garage, then the limit has been exceeded, in their opinion. The female consumers expressed beliefs that the larger trucks (SUV’s and Pickups) were too big and manly. They indicated being either intimidated or turned-off by the size, power and masculine perception. After viewing sketches of a concept vehicle that was essentially an extended minivan, they expressed discontent, as stated in the fourth quote. Several remarked that it looked like a limousine. It was just too long for their liking. Again, the consumers believe the size limit had been exceeded.

### **3.3.6 Total Reliability in Safety and Endurance Promote Confidence**

There is a very co-dependent framework in this grouping that links confidence through the reliability of a vehicle’s overall safety capabilities and absolute endurance during vehicle operation. Vehicles are expected to provide certain standards of safety and levels of endurance. Without the reliability aspect all confidence is lost. Confidence is a respect earned from the consumer when reliability is experienced through proven safety measures and advancements coupled with an ability to provide lasting quality. The consumer sincerely values these feelings and attributes and places a heavy weighting on their influence over vehicle purchases. See **Figure 3.3.6** for the affinity diagram for the mapping of the titles and requirements.

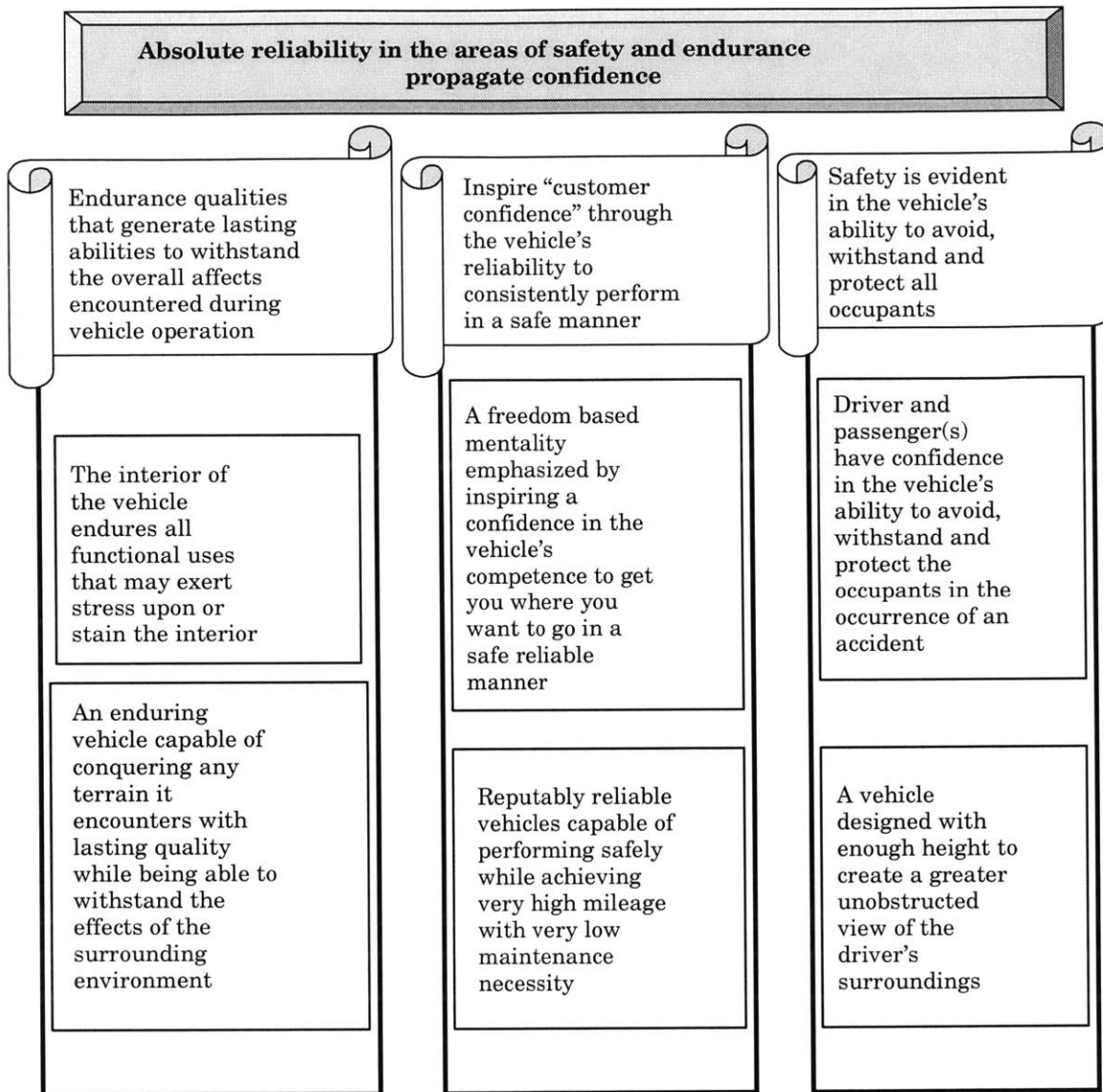


Figure 3.3. 6 – Affinity Diagram for Total Reliability in Safety and Endurance Promote Confidence

### 3.3.6.1 Withstand All Effects Encountered during Vehicle Operation

#### “Interior of Vehicle Endures all Utilities Performed”

*“I prefer cloth as opposed to leather, because it gets so dirty. It's easier to clean the cloth. So it's going to look clean; it's going to look neat.”*

*“...that tailgate is carpeted, I'm telling you I have used more different types of Mr. Clean on that material; and it's hopeless...it just looks like it's been abused.”*

*"...can haul more [in a pickup] without concern to the effect to the interior of the car."*

Note that the people who drive or are considering purchasing a more luxury-oriented vehicle raised these issues. The desire for luxury is there but functional utility is still in demand. Certain activities that are performed in vehicles have a tendency to mistreat the interior. The task at hand may exert stress or may stain the seat material, carpeting or wall siding. The fact that the vehicle can perform these various tasks is a delight to the consumer; however, the ease of cleaning or the lack of damage is what is key in this situation. The interior must be capable of being easily restored to a respectable condition or remain without an abused look. The last statement raises an interesting and valid point. The pickup allows the consumer to perform a task without concern to the interior. The fact that it's outside of the cabin is not really the reason; the bed-liner is the real crux. It's easily cleaned and can take a beating. Consider the rear section of vehicles (SUVs and minivans) being lined with material similar to that of a bed-liner. It could be an option or possibly designed as an inlay used for whenever a dirtying task is performed. It may also be viewed as an indication that a cross-vehicle similar to a Sport-Trac (SUV with a flatbed on the back) is what they have in mind.

#### **"Vehicles that Conquer all Terrain and Environments with Lasting Quality"**

*"I don't say abuse it [Tahoe], but you can really use it, you know, you can pull a lot of weight in it and the stuff is made more substantial. Things don't fall off of it."*

*"I mean it has a truck brakes, and it has truck mufflers and different features; it seems to last."*

*"Endurance...Its ability to hold back roads, side roads, and when we're even on the dirt roads. You have the paint damage from the branches scratching it, wheel misalignments, suspension problems because you take it off-road."*

*"And you want somewhat of a car that can, you know, take it. A little bit more sturdy than the Taurus."*

These statements suggest focusing on the ruggedness of the vehicle exterior and the vehicle's ability to handle the extremes of the surrounding environment with lasting quality.

Consumers want to be able to use the vehicle without fear of it failing under the test of the task it is being asked to perform. There seems to be a perception, according to the second quote, that trucks are emblematic of ruggedness. Typically ruggedness would suggest an ability to handle a variety of terrains and climates. Ruggedness in this case, however, incorporates an ability to preclude any exterior body damage such as paint chips and scratches, dents, etc. If a vehicle is going to be designed to cover a vast array of utilities it must be able to handle the two extremes with merit. That is, the vehicle must perform in the dirt as well as take the person out for a special evening on the town. Ruggedness will also imply lasting quality of the overall vehicle. The consumer undoubtedly expects this, particularly from a truck. The consumer wants a vehicle that has a propensity to last, even when subjected to extreme conditions. A valid question then arises: Do cars really need to portray the same rugged image as that of trucks? The last quote is biased toward that concept. A sedan would obviously not be expected to perform the same utilities as a truck, but perhaps this is another proponent toward the idea of a cross-vehicle once again. The consumer does, however, expect the vehicle to have a similar lasting quality and any exterior protection advancements would definitely apply to the sedan.

### **3.3.6.2 Inspire Customer Confidence through Vehicle Reliability**

#### **“Freedom Based Mentality Emphasized by Confidence in Vehicle Competence and Reliability”**

*“I feel peace-of-mind. I don't know - it's been two years now. And I've never once given a thought to this car [Taurus] for trouble. I really just rely on it.”*

*“I do what I want, when I want. I feel I can do that with the car...I feel as though it is there for me. I feel that I can rely on it. I feel comfortable with its workings.”*

*“...reliability rating is always good on all their [Mercedes] products. They design them to make you safe on the road and to get to where you're going.”*

The majority of all the LEBs voiced freedom as an important asset. Between work, family, travel and leisure times consumers expressed a need for the freedom to facilitate all

those areas of their lives in a reliable manner. As the first quote illustrates, reliability is most associated with the trouble-free operation of the vehicle. Peace-of-mind becomes a product of the confidence inspired through reliability. The second quote is a perfect cohesion of all these concepts. It provides the freedom to go anywhere at anytime, they can rely on it being there for them and have confidence in its ability to perform. The final statement explains by example that reliability isn't something that just happens. It must be designed into the product and it must perform consistently in order to acquire the confidence of the consumer.

#### **“Reputation for Safety and Overall Vehicle Reliability”**

*“I want the reputation and the safety and the reliability that comes with a Mercedes.”*

*“It got good ratings. Good repair record. Good satisfaction from prior owners.”*

*“I had a Lincoln Continental with 218,00 miles and very little maintenance required.”*

*“Quality is something I've earned and I deserve it.”*

Quality is a difficult word to really define since it truly encompasses many of the previously mentioned categories. The consumer envisions a quality vehicle as reliable, capable, safe, reputable, innovative, attractive, well built, comfortable, accommodating, and so on. Quality is another characteristic that is consistently associated with particular brands, e.g., Mercedes, because of its reputation. It's built on the rapport created through the satisfaction attained by previous owners. A quote like the third statement is a good example of what needs to be accomplished by the vehicle in order to achieve the recognized status of “a quality vehicle.” The bottom line is that consumers expect quality and believes that quality is something they deserve.

#### **3.3.6.3 Safety through Avoidance and Ability to Protect in Collisions**

**“Occupant Safety through Ability to Avoid and Offer Protection in the Occurrence of an Accident”**

*"He has to drive a lot so he should have a 4WD vehicle."*

*"I feel safe because I was hit from behind by a van...destroyed my car [Camry] but I walked away without a bruise...the car crumbled but the passenger cabin was left safe."*

*"There are a lot of pros and cons on the air bags...there's no small children at this point...I like having the air bags, the dual air bags. And I believe with the air bags on the sides...that would be very comforting."*

*"[SUV] directional blinkers in the mirrors are great because the others on the road see them and it pre-warns them I'm changing lanes or turning."*

The safety aspect of a vehicle appears to be separated into three main categories: ability to avoid; constructed to withstand; and implemented with devices to protect. The accident-avoidance factors consist of excellent maneuverability, increased vision of the surroundings, 4WD for added control in variable road conditions and features like the blinkers specified in the fourth quote. The LEB group, because of its affinity toward safety, would definitely welcome additional safety feature advancements. Part of the appeal of the larger vehicles is the notion of security from the rest of the driving world. The larger size provides a substantial protective zone between the occupants and the object of impact. The second quote is a caption relating the importance of a vehicle's ability to withstand a collision. The ability to withstand a collision should not rest solely on the protection zone since sedans will not necessarily be able to offer this added size. Structural design of the vehicle itself will have to be considered in order to accommodate this aspect. The last category deals with the features or attributes of the vehicle that contribute to occupant safety in the case of an accident. One consumer who was in an accident commented on the protection offered by the headrest. Many of the consumers desired the additional height provided by the larger vehicles because they are physically out of the crash zone. The issue of tipping over, in the larger vehicles, was another issue the consumer felt reasonably uncomfortable about. Airbags obviously were thought of as conventional. The people interviewed showed a definite interest in new advancements in all areas of safety.



### **“Use of Height to Create a Greater View of Driver Surroundings”**

*“[SUV] easy to see people around you because the blind spots are much smaller.”*

*“...you see better [in high ride] so there's more time to plan out ahead when driving.”*

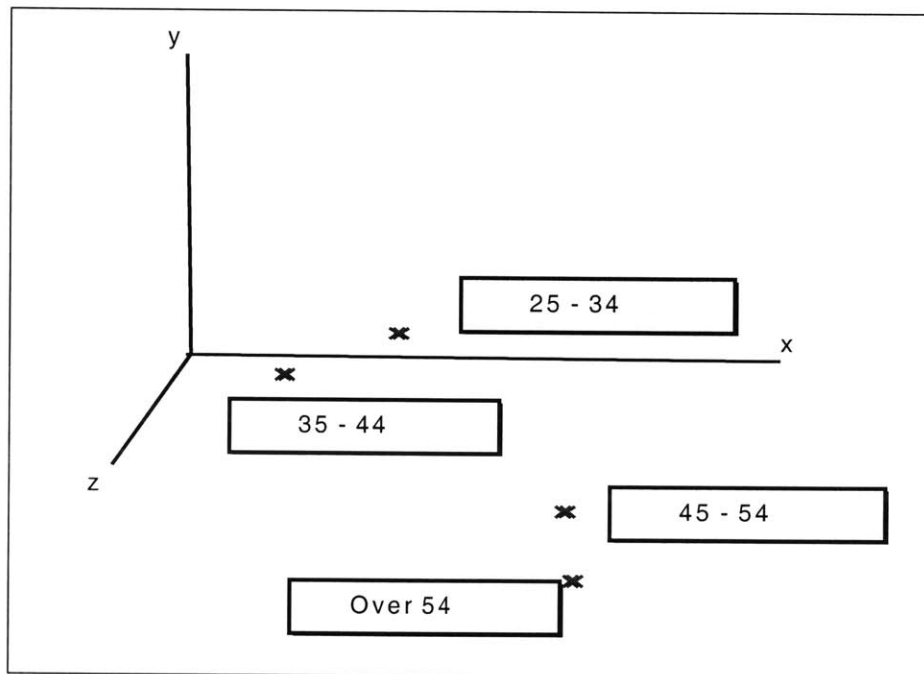
*“You sit up higher, you can see farther, and you've got this steel cage kind of surrounding you.”*

This section is self-explanatory. Consumers prefer to have the added height because of the simple fact it provides them a much greater view of the surrounding environment. It affords a better view in relation to the immediate traffic they are in as well as the traffic farther up ahead. It allows them to better assess their current situation and plan out ahead what they want to do. Reduced blind spots and the ability to see down the road to plan their moves produces a much safer driving environment for those individuals.

### **3.4 Developing the Questionnaire**

The questionnaire (refer to **Appendix A**) was designed based on the 6 level-2 groups derived in the affinity diagram process. These 6 groupings acted as guidelines in the formulating of the questionnaire questions. There were six individual sections comprising the questionnaire and approximately 7 to 8 questions per section totaling 45 questions. The questionnaire was scaled using the Likert-scaling system, which provides the respondents with a “strongly agree/agree/somewhat agree/somewhat disagree/disagree/strongly disagree” format in order to answer the question. The questionnaire was administered to people of varying age ranges, internal and external to Ford Motor Company. This is the point where inconsistencies entered into the study. One of the LEB’s qualifications is to not be employed by an automotive company due to too much bias being involved. However, many of the questionnaire respondents currently work for Ford. Another qualification required being in the 45 to 55 age range. A total of 131 responses were collected with ranges in age from 25 to 66 years. As a prelude to the next section on Factor Analysis, a noteworthy point must be expressed for clarification. There was a question as to which, if not all, data should be used from the questionnaire responses. The fact that this study is targeted on the LEB demographic, it seemed only appropriate to use the pseudo-LEB information collected. That is, the 45-55 age range of respondents. Since the data had been collected, for the sake

of science, the average scores for each question were calculated for each of the age ranges and plotted on a perceptual map. This was performed to verify whether there was a distinction between the age groups and their responses. As it happened, all four age groups responded somewhat similarly to the various rotated factors selected as axes. It was noted that the *45 to 54* and *Over 54* age groups remained quite consistent and close together through the various perceptual map conditions. Refer to **Figure 3.4.1** for one of the perceptual maps used to determine the relevance of age on vehicle needs. That being the case, the respondents of both the *45 to 54* and *Over 54* age categories were combined to form the cohort of 46 people classified as the LEBs used throughout the rest of the study.



**Figure3.4. 1 – Perceptual Map of All Age Ranges**

### 3.5 Factor Analysis of the Voice of the Customer

The analysis of this part of the study is to process the questionnaire data and extract more interpretable results. The steps in the analysis include:

- Market segmentation using cluster analysis based on the raw data from the customer responses.
- Descriptive statistics to characterize the market segments.
- Principal component analysis is used to reduce the dimensionality of the data and to

extract the most important information.

- Rotated factor analysis to identify the underlying factors.
- Perceptual map is employed to better communicate the factors.

Cluster analysis involves grouping customers together who share similar ideas and values. Commonly, groups of people are not scattered evenly through an n-dimensional space, but instead, form clumps or clusters. Upon identifying these clusters a characterization of that group may be formulated. In this study, combining the individual questionnaire respondents in accordance to the similarity of their responses formed the clusters. See **figure 3.5.1** for the cluster diagram (referred to as a dendrogram) created by the LEB responses. There were a total of 4 distinct cluster segments that emerged, and to better understand this market segment distinction, it was necessary to plot the values on a perceptual map. The differing market segments are determined by analyzing the perceptual maps and the clustering habits of the four groups with respect to the various axes. Perceptual maps and their significance in defining the market segments are explained in greater detail in the following parts of this section. Several steps involving principal and rotated component analysis must be performed prior to creating the maps. The individually evolved segments will be discussed at that point.

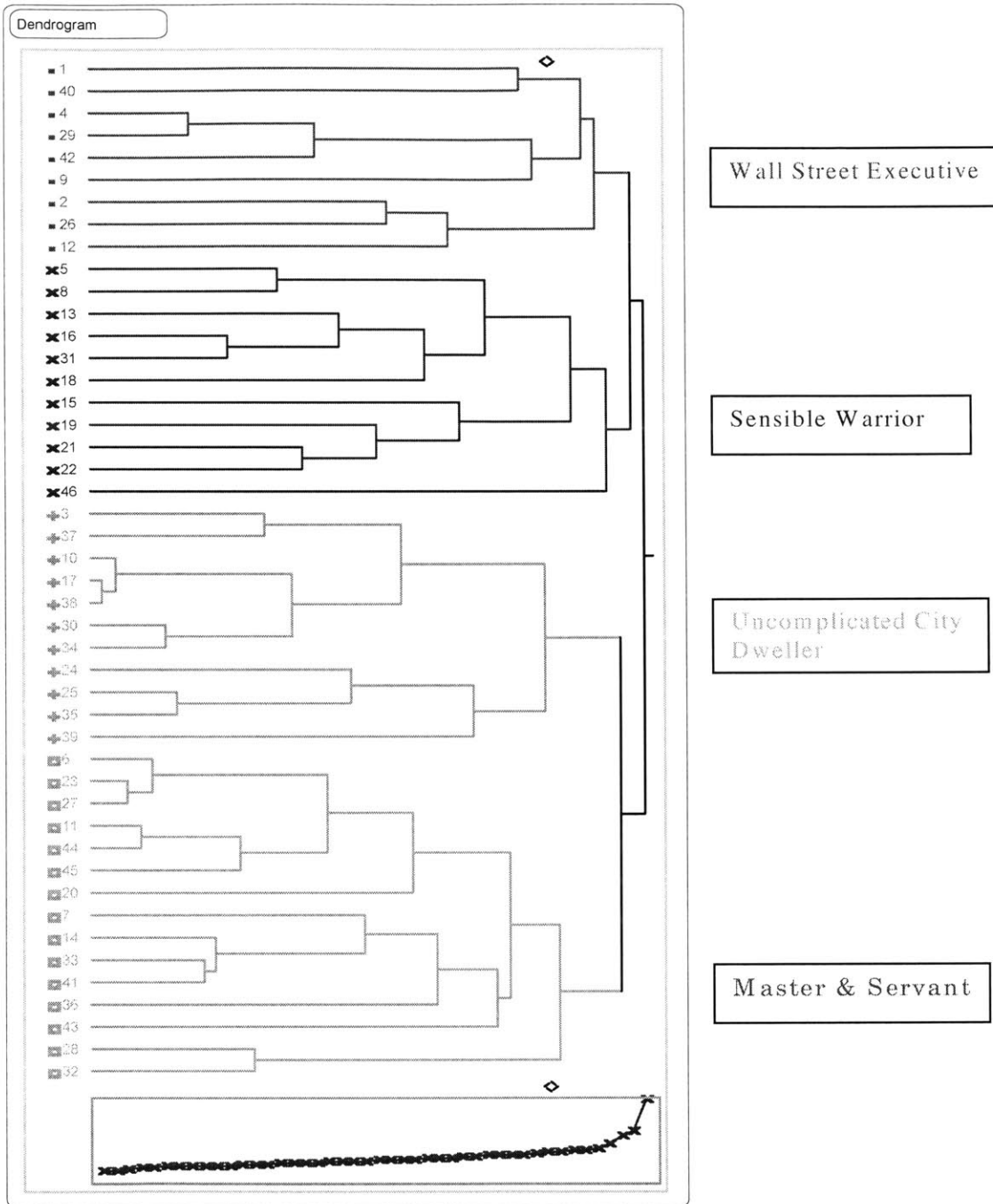


Figure 3.5. 1 – Dendrogram Illustrating Clusters and Market Segments

In factor analysis the first step was to correlate the data entered so that each variable was related to each of the other variables utilizing correlation factor values. These factors are extremely difficult to interpret and organize because of their small size in value and the dimensionally large nature of the correlation matrix. By performing principal component

analysis on the correlation matrix it was possible to extract valuable information. Factor analysis was performed on the data recovered from the questionnaires by identifying the structure based upon the way the respondents evaluated each question.

Factor analysis has two purposes: data reduction and substantive interpretation. Reduced dimensionality of a large set of needs allows for picturing the structure of the data as completely as possible, using as few variables as possible. This reduction affords easier identification of the dimensions underlying the observed variables. Principal component analysis was the first factor-analytical technique applied. The benefit of principal component analysis is that it leads to unique results. It transforms interrelated variables into a set of unrelated linear combinations of these variables. The first principal component is technically a linear combination of the standardized original variables that has the highest possible variance. The subsequent principal components are all uncorrelated with all previously defined components. Refer to **Appendix B** for a partial copy of the principal component report generated illustrating the seven components being referred.

The *EigenValues* and *CumPercent* were the two particular values utilized from the principal component report. The Eigen value essentially refers to the number of questionnaire questions literally captured by the individual components. In our case, the first principal component captures approximately 12 of the questionnaire questions, 5 are captured by the second component, and so on. It was decided to capture a total of roughly two-thirds (30) of the questions. By totaling the Eigen values for the first seven factors in the principal component matrix we see that 29 of the 45 questions on the questionnaire are intrinsically involved with the seven principal components. The Cumulative Percent value of 64% allocated to the seventh principal component states that 64% of the information acquired was derived from the first seven components. Simply stated, 64% of the information ascertained from the questionnaire comes from the seven main factors represented by approximately 29 of the 45 questions. The caliber of information that's extractable from the first seven components greatly outweighs the complexity faced when more of the components are considered. By virtue of less than 2 more questions becoming relevant and an information gain of 3.8% evolving from the addition of an eighth component, it was decided to maintain a rotate level of 7.

The principal component matrix still imposes a difficulty in acquiring data that is readily understandable and truly informative. The realization that much of the information

offered at this point is still considered extraneous, forces us to focus attention on a few selected components. Following this realization, a factor rotation was performed to better align the directions of the factors with the original variables so that the factors may be more interpretable. The fact that a perceptual map will be the ultimate outcome from this data there is an implicit desire to reduce the number of components involved. The rotated factor pattern created (see **figure 3.5.2**) provides information that leads to the identification of the dominant attributes. Note that each of the columns represented in the rotated components report are the orthogonal combinations of the principal components that correspond to directions of variable clusters in the space. All seven of the rotated components have values that are highlighted, which indicate a clustering within that component. Each of the highlighted values were subjected to the constraint of 0.55 or higher, a specification that was selected based on being able to acquire the more predominant loads. Each value corresponds to a “C”-identifier that simply indicates a particular question in the questionnaire. For, example, in the first rotated component “C7” is highlighted, which indicates a significant preference is placed on Question 7 from the questionnaire.

Rotated Components

Rotated Factor Pattern

C1	0.1779410	-0.79406	0.2214164	-0.16599	0.1893299	0.0165366	0.0709602
C2	0.0936016	-0.018656	0.1042917	-0.756347	-0.051108	-0.054353	0.1000434
C3	-0.181171	-0.66196	0.0976419	0.1080390	-0.14306	0.1588046	0.2107590
C4	0.0378804	-0.11833	-0.188311	-0.733217	-0.182261	0.0872458	0.1441181
C5	-0.259454	-0.511795	0.0491128	-0.549258	-0.022541	0.1147243	0.1745324
C6	0.1740636	-0.666489	-0.094344	-0.008271	0.1919423	-0.064488	-0.124471
C7	0.6343636	0.0445762	-0.164209	-0.038102	0.2566527	-0.025743	0.2921159
C8	0.0916813	-0.052543	-0.13478	0.0296080	-0.151191	0.2726415	0.6575164
C9	0.1180681	-0.034038	-0.056876	-0.208561	-0.0312	0.1719361	0.7682140
C10	0.5301560	0.2050819	-0.233757	-0.344159	0.0661852	0.0517845	0.1410912
C11	0.2912675	-0.035058	-0.396237	-0.269737	-0.313913	0.4544628	0.1884828
C 12	0.4553459	0.0217494	-0.185058	-0.24492	-0.213511	0.3479831	0.2752215
C 13	0.0709306	-0.19951	-0.164417	-0.235541	-0.115933	-0.008996	0.6983763
C 14	0.2024896	-0.300377	-0.025698	-0.29273	-0.252033	0.3064172	0.2884249
C 15	0.1816941	-0.027418	-0.021201	-0.166832	-0.226437	0.6954913	-0.024731
C 16	-0.022668	0.0456133	-0.056779	0.0502002	0.0793800	0.7385814	0.1516193
C 17	0.5489025	-0.413575	0.1850014	-0.121039	-0.213859	0.2849021	0.1795658
C18	0.6258311	-0.12991	-0.019921	-0.102507	-0.416326	0.0892750	0.2273085
C 19	0.7331382	-0.193885	0.0144370	-0.007393	-0.25978	0.2578870	0.0084090
C 20	0.8238081	-0.239234	-0.102874	0.1708423	-0.046769	0.1089469	-0.231074
C 21	0.4371598	-0.080066	-0.067253	-0.045208	-0.232079	0.7328131	0.1138837
C 22	0.3821677	0.0321311	-0.282098	-0.107195	-0.25959	0.5527422	-0.11059
C 23	0.2242768	-0.535484	-0.218496	0.1358487	-0.363594	-0.075006	0.3279835
C 24	0.1103737	-0.217388	-0.387737	0.1914941	-0.512899	-0.012343	0.1752825
C 25	0.2213389	0.0758577	-0.142302	-0.19555	-0.76185	0.1564790	0.1253489
C 26	-0.097061	-0.098545	-0.03196	-0.071788	-0.606076	0.2863228	0.3321693
C 27	0.2656165	-0.572627	-0.112523	-0.111677	-0.232193	-0.014425	0.2192236
C 28	-0.029765	-0.573884	-0.338781	0.0326336	-0.402932	0.0181556	0.3275795
C 29	0.0667668	0.0054068	-0.351624	0.0076327	-0.423056	0.4337257	0.2632535
C 30	0.1172708	-0.777588	-0.241578	-0.003057	0.0259728	-0.117426	-0.16319
C 31	0.1057210	-0.066677	-0.586153	-0.543449	-0.098151	0.2661580	-0.001795
C 32	0.0226669	-0.491719	-0.588729	-0.000741	-0.113021	0.0168632	-0.046754
C 33	-0.088012	-0.228317	-0.73114	-0.35735	0.0109572	0.2678797	0.0838651
C 34	0.0203040	0.0339754	-0.801331	-0.128062	-0.155165	0.0863027	0.2001113
C 35	0.0283235	-0.53549	-0.295001	-0.093918	-0.187243	0.1835156	0.2594638
C 36	0.2237024	-0.338075	-0.598339	0.1520452	-0.222381	0.2458704	0.0924149
C 37	0.2900497	-0.127997	-0.624067	0.1374197	-0.079436	0.1841766	0.2008671
C 38	0.0776258	0.3484263	-0.533969	0.2840164	-0.283345	-0.153302	0.0545202
C 39	-0.072903	-0.484408	-0.456033	-0.150409	0.1002198	0.1686226	-0.018543
C 40	-0.086154	-0.348232	-0.074359	-0.135352	0.0846147	0.5877925	0.2295570
C 41	0.1006022	0.0132413	-0.22869	-0.257502	-0.508198	0.4639170	-0.042702
C 42	0.3636796	0.4005840	0.0434606	-0.48267	-0.244119	0.1978618	0.0341915
C 43	0.1012733	0.0238393	-0.098408	-0.161919	-0.844555	0.1337502	-0.039988
C 44	0.1759257	0.2609705	-0.4233	0.1285560	-0.303643	0.6059644	0.1895778
C 45	0.0988329	-0.065495	-0.317877	0.0878331	-0.276363	0.5328107	0.4460065

Figure 3.5. 2 – Rotated Component Report

Performing a level-7 rotate on the principal components provides a rotated factor pattern with seven distinguishable main factors and their individually weighted “importance” attributes (see **Table 3.5.1**). The emphasized attributes for each of the rotated components were reviewed and interpreted on an attribute “concept inter-related” basis.

<b>Factor 1</b>	<b>Factor 4</b>
FWD Enter and Exit is Effortless Improve Travel through Vehicle Adjust Seat Configurations	Handle Family Related Experiences Responsive and Smooth Power to Accelerate and Haul
<b>Factor 2</b>	<b>Factor 5</b>
Handle Recreational Experiences Handle Work Related Experiences 4WD Luxury Minivan Hands Free Control Getting Back to Nature	Better Gas Efficiency Easily Cleaned after Use High Mileage and Low Maintenance
<b>Factor 3</b>	<b>Factor 6</b>
Enjoyable and Exciting Experience Positive Image Portrayed Unique Attractiveness Sexy, Sleek and Curvy Shape Euro Style Design Modern and Today Styling	Organizers for Small Item Storage Doors Restrict Access In and Out Increase Storage Behind Rear Seat or Trunk Special Features to Simplify Item Transportation Interior Suited to Handle All Utilities Advancements in Safety and Accident Prevention
	<b>Factor 7</b>
	Dashboard is Sleek and Simple with No Clutter Ergonomic Placement of Controls and Features Quality Sound System

**Table 3.5. 1 – Main Factors from Rotated Components**

Factor 1 of the rotated components has four seemingly important variables it addresses. Attributes like FWD, entering and exiting the vehicle without effort, improved travel through the vehicle and ability to adjust the seat configuration illustrates a customer interested in easy physical interaction with the vehicle. Similar steps were followed in deriving the other six factors’ titles. The rotated factor titles that evolved are:

1. Easy Physical Interfacing
2. Conquering Multi-Functionality
3. Stimulating and Distinct Styling



4. Comfortable and Responsive Utility
5. Low Maintenance and Ownership Costs
6. Ultimately Convenient and Accommodating
7. Effortless Driving Ability

The time has come to involve the use of perceptual mapping. The individual consumers with similar values and needs lie close together on the map and thus form “like-need” clusters. The rotated factor titles represent the various axes of the perceptual map and indicate the favored tendencies of the clusters. Once these favored tendencies are interpreted for the various combinations of rotated factors, the cluster can be distinguished by name. There were a total of 21 perceptual maps consulted in analyzing the clustered market segments, however the four that are depicted in **Figures 3.5.3 and 3.5.4**, illustrate the dominant maps used in the conception of the actual classification of the segments.

The first market segment was named *Master & Servant* with the consumer playing the role of the Master and the vehicle, the Servant. This group as a cluster has an affinity toward convenience, easy interfacing and accommodating abilities. They want everything done for them, or at minimum, have a high easiness-factor associated with the task. The perceptual map in **Figure 3.5.3** (Top) illustrates the bias the Master & Servant cluster (large box squares) has toward “easy physical interfacing” and “effortless driving ability.” The second market segment realized is classified as the *Wall Street Executive*, whom as a group have a propensity toward “stimulating and distinct styling,” as depicted by the clustering (small solid squares) in **Figure 3.5.3** (Bottom). The consumer is adamant about projecting a particular image and feels the desire to stand out in a crowd. They favor vehicle comfort but also hunger for control-oriented attributes like power and responsive handling. The third segment that evolved was unusual because it revealed apathetic emotion toward the majority of the factors; however, they indicated a strong split in interest for “comfort and responsive utility.” That cluster segment was labeled *Uncomplicated City Dweller*, where “uncomplicated” projects the fact they have no outstanding needs and vehicle utility will kept to a simplistic level. The “city dweller” part of the caption actually expresses the reality of their strong disposition with regard to the vehicle’s non-requisite capabilities for off-road use, including associated features like 4WD.

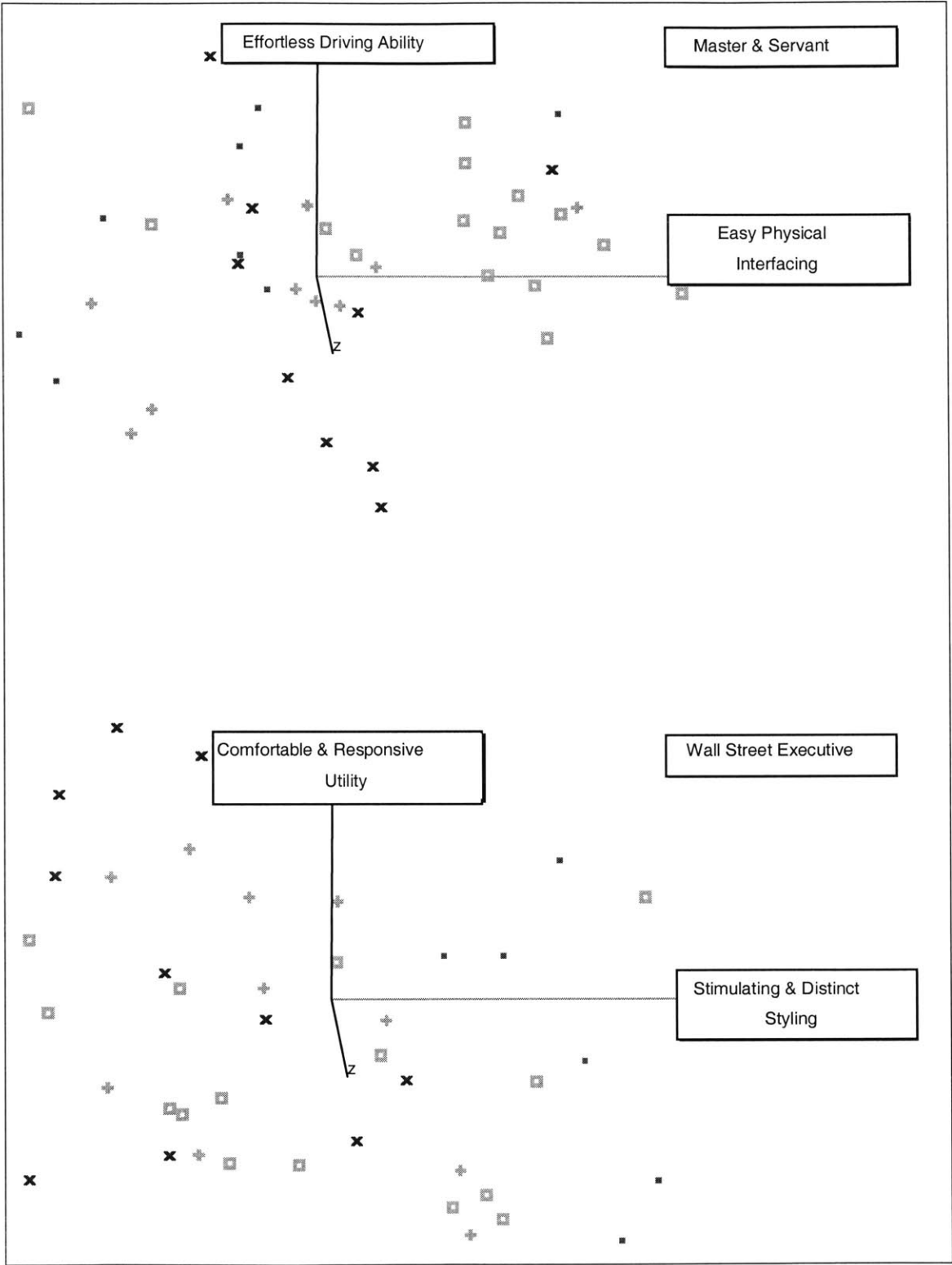


Figure 3.5. 3 – Perceptual Maps for Master & Servant (Top) and Wall Street Executive (Bottom) Market Segments

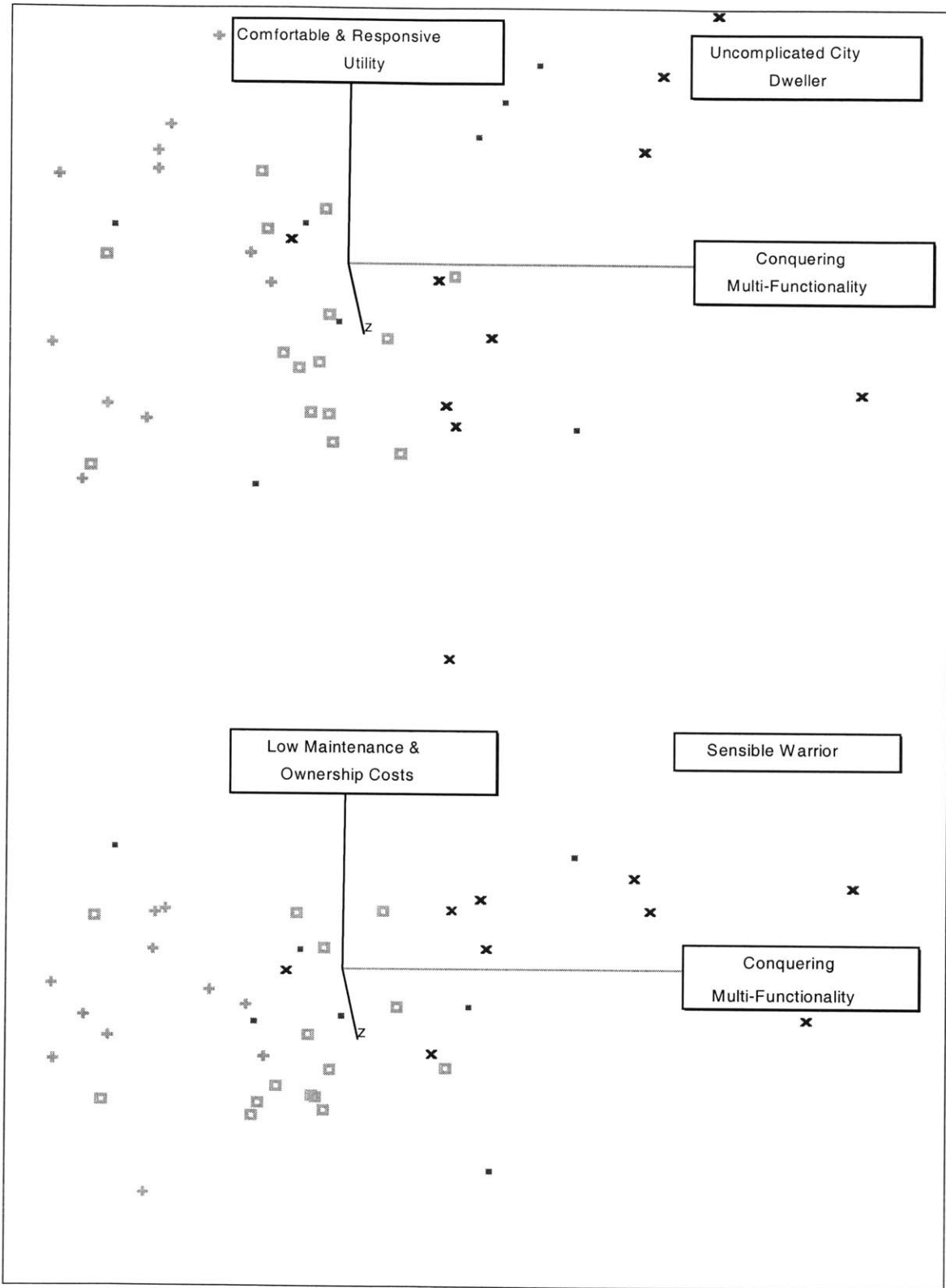


Figure 3.5. 4 – Perceptual Maps for Uncomplicated City Dweller (Top) and Sensible Warrior (Bottom) Market Segments

**Figure 3.5.4** (Top) depicts this very clearly, by virtue of all the plus (+) symbols being heavily congregated on the opposite side of the “conquering multi-functionality” axis. The final market segment that developed was called the *Sensible Warrior*. The “Warrior” aspect of the title is actually attempting to capture the opposite connotation of the “City Dweller.” These consumers display a powerful need for vehicle dominance and functionality. This group also has a “Sensible,” or practical, side about them, which is conveyed through their need for “low maintenance and ownership costs.” This segment is concerned about the vehicle performing reliably and efficiently and demanding very little attention with respect to vehicle upkeep. Both needs are portrayed in **Figure 3.5.4** (Bottom) by the clustering X (x) symbols.

## 4. Customer Satisfaction through Consumer-Driven Design

Henry Ford had the foresight to recognize the importance of customer satisfaction back in 1934.

*“If the people who use our cars every day are not praising them, it matters little what we may say. The last word must be spoken by the car itself, and the owner who tells his next door neighbor how his car behaves in actual service is the only effective advertiser”*

- Henry Ford

### 4.1 The Kano Model

Ford Motor Company believes the solution for customer satisfaction is the Kano model (Kano *et al.*, 1984). The Kano model exhibits a consumer mindset approach by imploring us to really understand what the customer wants, how they use the vehicle, how potential features impact satisfaction and where the leverage is for satisfaction increase. This method is useful in uncovering the importance of product features relative to the consumer by recognizing the relationship between the fulfillment of requirements and customer satisfaction is not always linear. The Kano model functions in a number of ways:

- Plans the approach to the vehicle line for current vehicles and new programs.
- Prioritizes cascade of metrics and targets – How good to we have to be?
- Visual aid to help manage engineering tradeoffs.
- Track progress judged on technical metrics on customer satisfaction items as programs progress through the product development system.

The Kano model deals with the product in a more rational sense than an emotional one. The fundamental representation of the Kano model is illustrated in **Figure 4.1.1**.

## The Kano model [ $y=f(x)$ ]

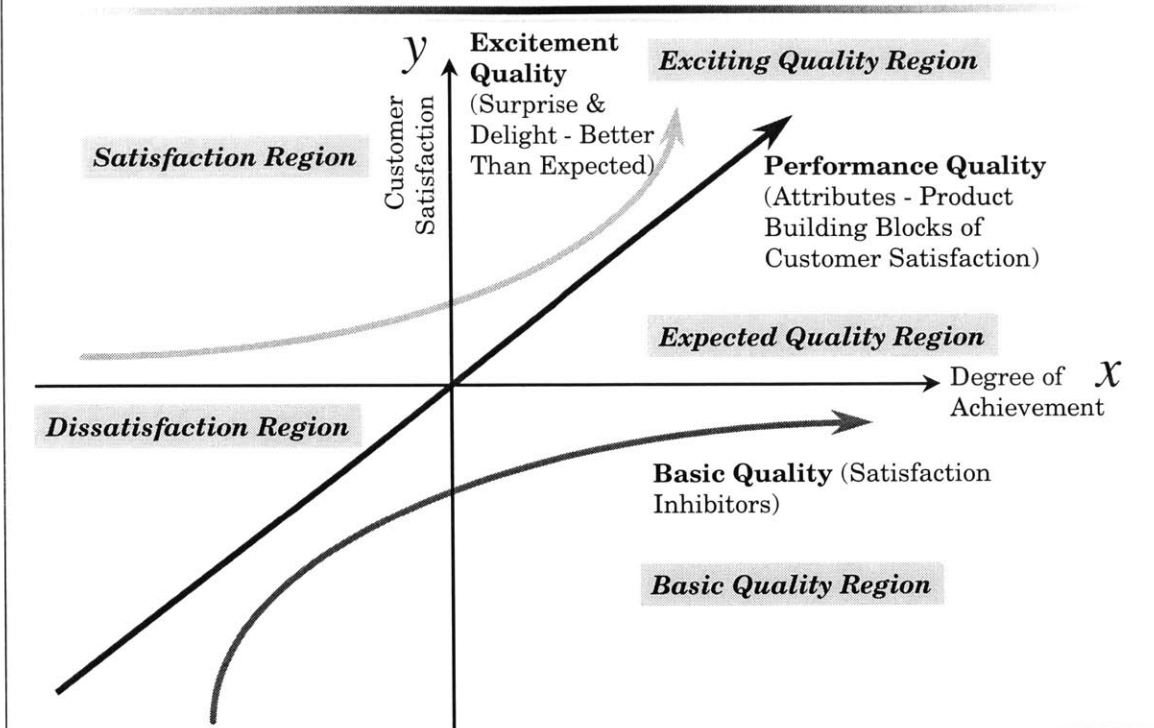


Figure 4.1. 1 – A Kano Diagram

Customer needs are characterized into three distinct categories:

- *Basic Quality* – The customer takes these needs (e.g., horn is inoperative) for granted. If these needs are met, they simply accept it as something to be expected, no greater satisfaction is derived. However, if these needs are not met sufficiently, then the customer becomes extremely dissatisfied.
- *Performance Quality* – Customer satisfaction is achieved when needs are fulfilled and dissatisfaction when they are not fulfilled. The better the need (e.g., fuel economy) is satisfied the better the customer likes the product.
- *Excitement Quality* – No dissatisfaction is caused in the absence of these attributes because they were not expected, and the customers are unaware of what they are missing. However, strong achievements in these attributes will increase customer satisfaction to the point of delight (e.g., rear power socket).

Each of the categories must be addressed through the planning and executing of metrics with the goal being to ascend on their individual scales.

### Basic Quality

For this category, quality history will typically be studied for potential failure modes and root causes are reviewed so they may be better understood. The end item design reliability/robustness is verified using an appropriate testing metric (see **Figure 4.1.2**) to move the satisfaction item up on the Kano model scale. The competition is benchmarked and proposed targets are made and incorporated in the various testing methods.

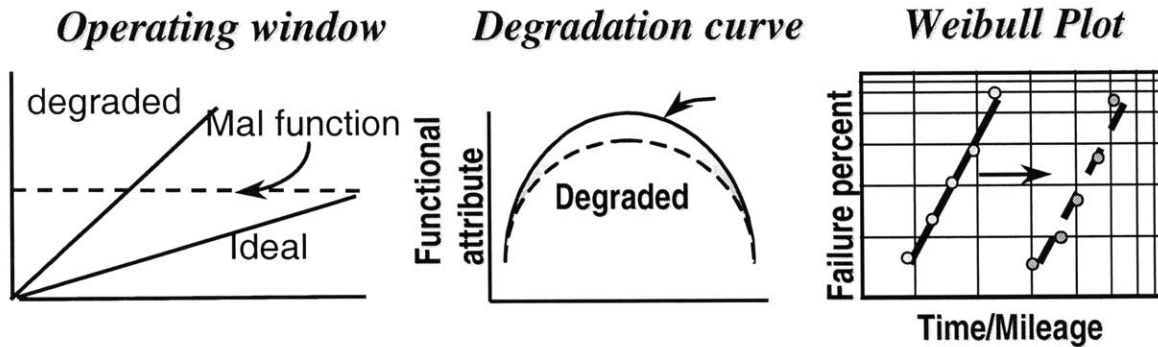


Figure 4.1. 2 – Testing Methods for Design Verification

### Performance Quality

Market Research would be conducted to confirm whether or not an attribute has high leverage on satisfaction. As stated previously, this is not a linear relationship since fulfillment of different attribute requirements will not have the same effect on customer satisfaction. Attribute targets are developed and connected to customer satisfaction, see **Figure 4.1.3** for an application of the procedure to customer satisfaction with regard to interior quietness. In order to achieve a 90% satisfaction rate, a noise level of 64 dbA will have to be targeted. The points on the graph indicate current competitive noise levels. The content in the program to be address is then reviewed and the end-item robustness metrics for the attributes are developed and delivered using methods such as signal-to-noise (S/N) ratios and degradation curves (refer to **Figure 4.1.2** for the degradation curve). Attribute satisfaction is delivered using analysis of critical to quality (CTQ) characteristics to move the satisfaction item up on the Kano scale. The “ $y=f(x)$ ” labeled on **Figure4.1.1** is simply a

mathematical representation of stating that customer satisfaction attribute (y) is dependent upon the ability to identify and develop the critical characteristics (x) composing the attribute in question. For example, if fuel economy (y) is being assessed, the characteristics critical to quality like engine fuel flow, parasitic loss reduction, electrical load reduction, weight and aerodynamic drag (x's) would have to be analyzed and tested to determine the optimal fuel economy (y). Optimality is typically based on competition benchmarked targets.

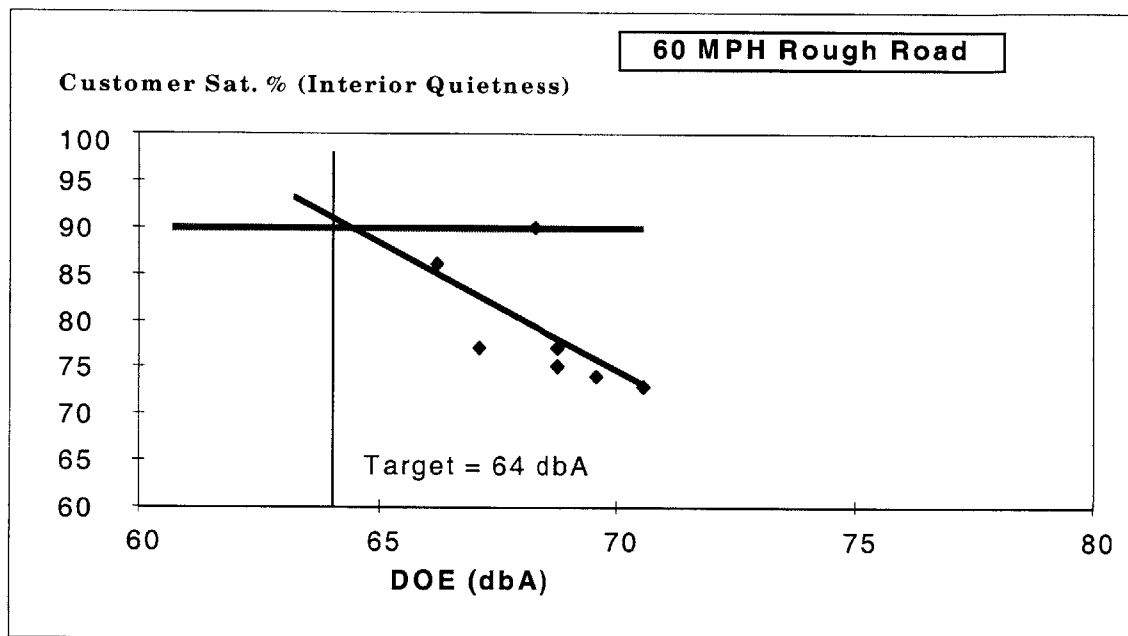


Figure 4.1. 3 – Attribute Target to Customer Satisfaction on Interior Quietness  
Excitement Quality

Surprise and delight satisfaction is simply driven by exceptional execution of the product attributes that drive the brand. The product attributes that surprise and delight are at a *vehicle* level but are decomposed to *sub-system* and *component* levels. For example, smoothness of ride is an attribute at the vehicle level. It does, however, decompose to frame stiffness and body structure, at a sub-system level and even further still to tire/wheel imbalance and axle, at the component level.

The attributes gathered in Chapter 3 have been categorized into the three quality classifications in **Table 4.1.1** and their positions are indicated on the Kano diagram in **Figure 4.1.4**. To better understand the divisions of Delighter, Satisfier and Inhibitor a Kano



questionnaire is utilized. However, in this study, the assigning of attributes to the individual categories was based on the voice of the customer approach in Chapter 3. The Kano questionnaire simply inquires about the customer’s feelings toward the different attributes in two different scenarios. For example, “If the ride was very smooth, how would you feel?” and “If the ride was hard and bumpy, how would you feel?” The customer is then given the option of, *enjoying it, expecting it, neutral, disliking it but living with it and disliking it and not accepting it*. The ride quality is a “Delighter” if the customer enjoys a smooth ride, but expects or can live with a hard and bumpy ride. It becomes a “Satisfier” if the customer enjoys a smooth ride and dislikes a hard and bumpy ride. Finally, the ride quality is an “Inhibitor” if the customer feels a smooth ride is expected and dislikes a hard and bumpy one. Note that there were only four of the Inhibitors actually mentioned by the customers interviewed. The others are typical issues that were used for clarification purposes.

<b>Delighters</b>	<b>Satisfiers</b>	<b>Inhibitors</b>
Front Seat Roominess	Fuel Economy	Exterior Trim
Responsive Handling	Seat Roominess	Bumper Function
Smoothness of Ride	Towing Performance	Ride & Handling
Distinct Exterior Styling	Quietness of Engine	Paint Appearance
Seat Configuration Capability	Solid and Durable Construction	Seating
Easy to Enter and Exit	Steering	Climate Control Function
Storage Innovation	Fun to Drive	Mechanical Malfunction
Sound Quality	Overall Engine Operation	Squeaks and Rattles
Rear Seat Roominess	Handling in the City	I/P Console
Cabin Capacity	Ease of Parking	Interior Trim
I/P Appearance	Manageable Size for Garage	Wind Noise
Ergonomic Feature Placements	Seat Maneuverability	Water Leaks
Engine Power and Pickup	Communication Capabilities	Quick and Easy Start
Visibility from Driver's Seat	Accommodate Loading	Mirror Function
Fuel Economy	Accommodate People	Restraints
Interior Easily Cleaned	Large Storage Capacity	Corrosion
Tough Exterior Body	Door Accessibility	Powertrain Sound & NVH
Interior Quietness	Rugged Interior	Brakes
Safety Innovations	Smooth Ride	Driveability
	Better Visibility	Manual Transmission Shifting
	Overall Reliable Performance	Fuel Fill and Delivery
	I/P Appearance	
	Interior Quietness	

**Table 4.1. 1 – Attributes from LEB Study Classified into Kano Model Categories**

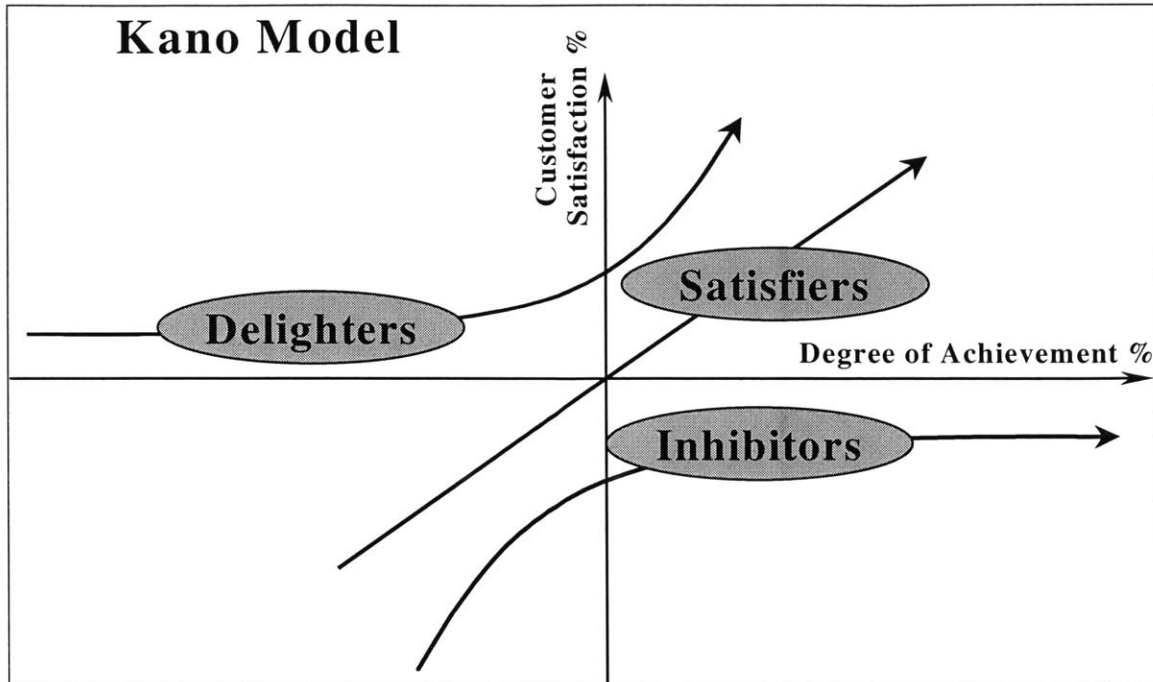


Figure 4.1. 4 – Kano Model Indicating Delighters, Satisfiers and Inhibitors

As stated above repeatedly, customer satisfaction is a critical element in remaining competitive in a global industry. One relationship that seems to be a common missing link in this key facet of consumer relations is that between the engineering community and the consumer. Stronger strides must be accomplished in this respect in order to harness a very powerful product-enhancing tool. Refer to **Figure 4.1.5** for an abridged version of how customer satisfaction plays a role in product engineering and design. The top box on each column indicates the path from customer to final validation of the product. The second box states the relationship between the customer and the engineering task at that phase of the process. The third poses the key question that highlights what needs to be accomplished and the steps or acts taken to satisfy that question. The fourth box is actually an example of how this may be applied to a real attribute, in this case the customer is referencing power for towing capabilities. Essentially, this tool will allow a product development team to turn customer voices/needs into products engineered to satisfy the customer. It can be applied to any and all physically related attributes. In the case of this study the highly leveraged needs could be viewed as the needs related to the seven predominant factors that evolved. However, this does not take into account the different needs and expectations of the individually defined market segments. Typically a customer satisfaction (CS) coefficient is

calculated to determine whether satisfaction can be increased through meeting the product requirement or whether dissatisfaction results from the requirement not being fulfilled. An “average impact” calculation for *satisfaction* and *dissatisfaction* is performed based on the results of the Kano questionnaire. The calculations are not discussed in detail in this study; however, a *satisfaction* calculation will result in a value between 0 and 1. The closer the value is to 1, the higher the influence is on customer satisfaction. The *dissatisfied* calculations are performed using negative values to emphasize its negative influence. The closer the coefficient is to  $-1$ , the greater that attribute influences customer dissatisfaction.

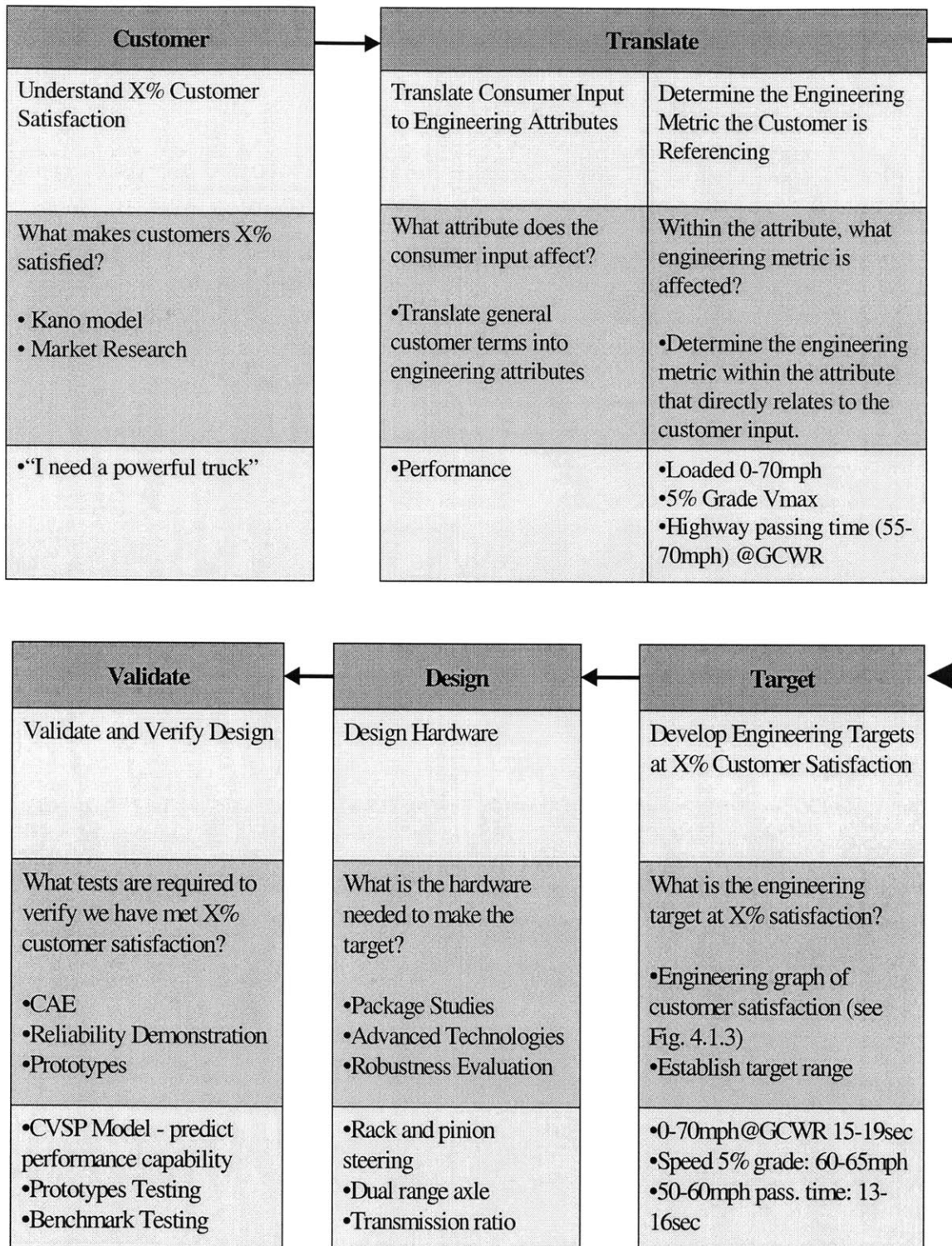


Figure 4.1. 5 – Delivering Customer Satisfaction through Engineering Process

## 5. Conclusions

### 5.1 Results of Study

The LEB demographic is a unique group to analyze because they are one of the few populations that have a major transition in lifestyle. The transition being referred to is that from a position of *parenting* where the kids still live at home to the *empty-nest* stage, where the children have moved out of the home. The number of empty nest LEBs will nearly double by the year 2005 vs. 1998. Slightly less than half of the LEBs involved in this study were already empty-nesters, leaving the other half with children still residing primarily at home. This mixture provided a better account of the LEB's interpretations of their vehicle's current status and the potential for the future. Nine separate interviews provided several hundred customer voices, which were narrowed down to 38 groupings of similar voices. These 38 voice-groupings were then subjected to a scrubbing process that produced 38 customer requirements. The 38 requirements were again re-grouped according to similarity and re-titled two more times. The results were 14 higher abstracted Level-1 requirement titles and 6 even higher abstracted Level-2 requirement titles. The six main requirements played an intricate role in the development of the questionnaire administered for the purpose of gathering data for a more detailed study using factor and cluster analyses. The cluster analysis, through the use of perceptual mapping, extracted four separate market segments within the LEB population. Seven principal components via factor analysis evolved, which essentially state the key attributes demanding focus as expressed by customer weighted importance via the questionnaire.

#### 5.1.1 Interesting Discoveries

The seven principal attributes appeared to cover a vast range of desires, from conquering ability to easy physical interfacing to distinct styling. The more diverse attributes tended to be the defining attributes for the individual market segments. For example, *easy physical interfacing* was very important to the Master & Servant segment, while *conquering multi-functionality* was high on the list of the Sensible Warrior. The fact that the LEB demographic encompasses a lifestage intersection may also contribute to the diverse range of attributes presented by the group. Still having children at home and the financial burden incurred

through support and educational costs have a definite effect on the intrinsic value of a vehicle.

The ZMET approach in the focus groups did not seem to produce the valuable insight into the deep regions of the customers' psyche that it professes to deliver. The very "feeling" oriented questions led to very obscure answers that structured them in a way that was very hard to put into a physical attribute design context. As an example, in one instance the interviewees were asked to use the senses of taste and smell to describe missing attributes that had not been mentioned in the previous discussion. They proceeded to state answers like *Hagendaz, Reece's Peanut Butter Ice Cream* because it's rich and creamy, to which the same person then said, "I really enjoy it." The question is then raised, "Really enjoy what, why and how?" and why was the association to ice cream necessary if all that is really extracted from that statement is the latter portion, "I really like it"? The moderator of the interview did a rather poor job in extracting deeper insight from the focus group. It appeared to me that in order to apply a methodology like ZMET usefully, an extremely articulate, open-minded, extroverted person must be on the receiving end of the questions. I believe this because both focus groups had a tendency to continually repeat the same ideas and feelings for a variety of questions. The ZMET approach also had a tendency to stymie the customer on their responses. Being articulate is necessary due to the difficulty in translating images into logical and relevant metaphorical language. Being open-minded will enhance and broaden the responses so that similarity is kept to a minimum and an extrovert will not be intimidated to share deeper feelings. The customers' voices extracted from these interviews were no different from the ones gathered from the one-on-one interviews.

The one-on-one interviews were traditionally formatted and had a definite focus on acquiring the relevant data. When dealing with a product or component having high engineering complexity, a data-gathering format that is straightforward, easily understood and limited to interpretation characteristics will deliver more desirable results. In our study, these traits afford easier probing in order to acquire deeper understanding. When one or both parties involved in the interview are confused about how to discuss the topic at hand, probing becomes very difficult. This is what can happen when the format is largely interpretable.

## 5.2 Integration into Product Development

The data gathered using the VOC methodology was used to illustrate the effectiveness of the Kano model approach in utilizing customer needs to guide strategic and operational engineering decisions and the metrics against which they are measured. The design of the Kano model provides a simple means whereby understanding customers and anticipating their needs allows for futuring with deep insight. It forces tougher technical targets and metrics and follows it up with engineering and reliability demonstration data. It reinforces the focus on the  $x$ 's (critical to quality characteristics) that drives the  $y$  (customer satisfaction) and distinguishes between basic quality, performance quality and excitement quality.

After discussing with a team member involved on the LEB Project Task team, it appears that engineering is still not playing a role in the upstream process of the product development cycle. The team consisted of members from Global Marketing, Lincoln Marketing, Product Innovation Office (Designers), Business Strategy Support and consultants in Advertising and Marketing. A few of the members are engineers by trade, but no longer operate in that capacity. Only after much of the legwork is complete and many man-hours are put into the project, does engineering get involved in the feasibility of making the vehicle. The incorporation of the engineer several steps back in the process will save a lot of time and money. For example, in the marketing research phase of the project, where a concept product is being subjected to market tests, a product will be altered along with the PIO designers to cater to market demands. Many of these modifications are made without engineering concerns. Once the concept satisfies the customer, a business proposal is submitted and evaluated on costs, volumes, market timing, etc. The Project management group then gets involved in laying out the timeline for the project. It is at this point that the engineers are faced with performing feasibility studies on a pre-conceived vehicle. If the engineers had the ability to interject their opinions at the research phase of the project, the customer would not have been tempted by a vehicle that conceivably cannot be manufactured. However, the time may have been better spent actually developing the vehicle concurrently so that the customers and engineering feasibilities were both satisfied.

Another interesting fact is that teams are continually formed with the goal of understanding the market for all market segments. The only concern is that once a team is discontinued all the pertinent information gathered by that team on the target market is lost

with the dispersion of the team members. There is a plan in effect to design a “keeper” who will become the resident expert of the information collected during the team’s time together so that when the next team is organized to study the same market or market segment, they will not start from ground zero again. The information will be readily accessible and the “keeper” will become a valuable resource.

### **5.3 Areas of Future Study**

The results collected from the voice of the customer study are to be compiled with other relevant data and involved in a presentation to members of Ford Management. The data will also play a role in determining potentially untapped markets via a program currently being developed at Ford. The program is based on an algorithm that will utilize the questionnaire data and determine where it lies in respect to our current models as well as our competitors’ in a market segment relationship. In that respect, market studies may be done in an attempt to gain *latent* or *futuring* needs from the customer and quantitatively verify their relationship to existing or “tapped” market segments.



## **Appendix A – Questionnaire**

What follows is the questionnaire that was administered to respondents external to Ford Motor Company. The format used for the respondents internal to Ford Motor Company was presented in a slightly different manner, however the content was identical.



**Your Name:**

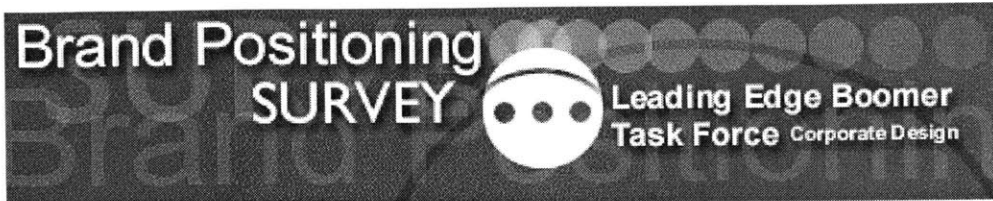
**What is your age?**

- Under 25
- 25 to 34
- 35 to 44
- 45 to 54
- Older than 54

**How empty is your nest?**

- I have young children not in school
- I have young children in grade or middle school
- I have teenagers in high school
- I have children approaching or attending college or university
- I do not have any children
- My children no longer reside in my home with me

**Please email completed questionnaire to: Chris Renaud [crenaud@ford.com](mailto:crenaud@ford.com)**



Please check the box that most represents your feelings regarding the following statements:

**Group 1 – Multi-Functionality**

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
1. My vehicle has to handle recreational experiences in my life (For example going to the beach, going on vacation, traveling off-road, hobby related uses, towing capabilities, etc.).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. My vehicle has to handle family related experiences in my life (For example traveling to visit other family members, transporting children to extra-curricular events, family vacations, involvement with grandchildren or elderly parents, running errands, etc.).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. My vehicle has to handle work related experiences in my life (For example associated business travel, socializing with clients, project a professional image, carrying work supplies or materials, etc.).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. My vehicle must provide firm responsive handling with a smooth comfortable ride.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. My vehicle should have the power to deliver quick acceleration with an ability to haul and tow various items.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I want Four Wheel Drive (4WD) capabilities on my vehicle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I want Front Wheel Drive (FWD) capabilities on my vehicle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Group2 – Ergonomic Luxury**

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
8. The dashboard (instrument panel) should be sleek and simple. Only the necessary gauges and indicators should be present in order to eliminate a cluttered look.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Ergonomic placement of controls and features are critical. (For example, stereo system controls on the steering wheel or the center console may be oriented towards the driver.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. The dashboard (instrument panel) should be arranged to provide an unobstructed view of all the controls so that they may be seen in a glance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. The seats should be extremely adjustable in order to accommodate the driver and their desired position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. The vehicle should provide a very smooth and quiet ride to reduce my stress and re-energize me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. The sound system quality must deliver a feeling of physically being at the concert.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Rear passengers of the vehicle should be equipped with the ability to control their own climate and individual sound system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Group 3 – Accessibility and Accommodation**

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
15. More organizers for small item storage are necessary. (For example side door pockets, pouches on the back of seats, glove compartment, center console compartment.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. The doors are major contributors in restricting the access in and out of the vehicle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. The vehicle should carry differing combinations of people and cargo without having to make trade-offs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Entering and exiting the vehicle should be effortless for all ranges of people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Improve the ability of traveling through the vehicle from side to side and throughout the vehicle interior.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Provide the option to easily manage all of the seat arrangements within the vehicle. Allow removal, reorganizing, swiveling, folding, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Offer greater storage capabilities in the trunk or behind the last seat (of minivans and SUV's).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Provide special feature options that simplify the transportation of items. (For example a device to hold groceries, luggage organizer, tool storage, cargo nets to prevent items from moving, interior restraint hooks, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Group 4 – Innovations**

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
23. Communication capabilities are very important. I need connections available for laptops, internet access, faxes, navigation systems (GPS), cellular phones, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. It's an added convenience if the vehicle is able to track its own maintenance schedule so it can inform me when scheduled or unscheduled maintenance is required.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. I expect vehicles to offer better gas efficiency without any negative affects to the vehicles quality or functional utility.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. The vehicle must be easily cleaned after performing "dirtying" functional uses.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. There is a need for a luxury model Minivan. (Visualize a Lincoln minivan.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. I must have voice activation technologies offering hands free control of functions that typically require physical interaction. (For example the phone, radio, wipers, ignition, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Advancements that benefit vehicle safety are very important. (For example rollover air bags, perimeter sensory detection, Global Positioning System (GPS), etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Group 5 – Distinctive Appeal and Image**

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
30. The vehicle should project a “getting back to nature” image. Going to the beach, off-road or mountains.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Driving the vehicle should be an enjoyable and exciting experience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. I want a very positive image portrayed. I’m successful, professional, environmentally sensible and fun.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. The vehicle should project a unique attractiveness without being pretentious.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Designs should favor a sexy, sleek and curvy contour as opposed to a square, rigid and hard appearance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. I want solid looks that are intimidating.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Incorporate more European styling in the vehicle. Emulate the likes of Jaguar, BMW or Mercedes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Designs should favor “modern and today” styles as opposed to “retro” styles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. SUV’s and Pickups project an image that is to “manly”.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. The tire appearance has a large impact on the vehicle image.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>





**Group 6 – Confidence through Safety and Reliability**

	Strongly Agree	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
40. Vehicle interiors need to be better suited to handle multi-functional uses.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. The exterior body should exhibit a greater resistance to everyday abuse like scratches, chips and denting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. I expect worry-free reliance on the vehicle’s ability to get me where I want to go, when I want to go.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. The vehicle should be able to achieve very high mileage with very little maintenance required.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Vehicles must provide safety advancements that offer accident “ <i>prevention</i> ”. Address night driving issues, maneuverability in all-weather conditions, increased visibility, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Vehicles must provide safety advancements that offer accident “ <i>protection</i> ”. For example, high seating position, direct emergency communication, interior space configurations, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**IMPORTANT:**

Please save this Word file as your name and email it to [crenaud@ford.com](mailto:crenaud@ford.com)

i.e. choose "save as" from the file menu in Word and save the file as: JohnDoe.doc



## **Appendix B – Principal Component Questionnaire Data**

Information used in Section 3.5 Factor Analysis of the Voice of the Customer

Principal Components

EigenValue:	11.9414	4.7524	3.1269	2.8364	2.2753	2.0650	1.8025
Percent:	26.5364	10.5609	6.9486	6.3031	5.0562	4.5888	4.0056
CumPercent:	26.5364	37.0973	44.0459	50.3490	55.4053	59.9941	63.9996
Eigenvectors:							
C1	0.05799	0.33822	0.24394	-0.00023	0.00388	-0.06964	-0.00312
C2	0.05383	-0.00189	0.22508	0.28273	0.19814	0.21605	-0.03450
C3	0.08208	0.25962	0.00263	0.05786	-0.25714	-0.09380	-0.04350
C4	0.13355	0.01248	0.09127	0.28730	0.20595	0.18322	-0.07591
C5	0.08284	0.21571	0.09246	0.34099	0.03050	0.02004	-0.09099
C6	0.04648	0.29374	0.06918	-0.12432	0.11759	-0.05961	-0.06006
C7	0.07850	-0.03113	0.14972	-0.18220	0.20870	0.01452	0.36694
C8	0.15013	-0.02599	-0.02452	0.08511	-0.17239	-0.03993	0.32810
C9	0.13787	-0.00984	0.06459	0.18847	-0.08722	0.02892	0.42281
C10	0.10095	-0.12594	0.13739	-0.04356	0.28885	0.09489	0.17192
C11	0.22169	-0.09893	-0.00114	0.03692	0.08409	-0.02520	-0.03126
C 12	0.18608	-0.10895	0.12575	-0.00921	0.06119	0.00962	0.09472
C 13	0.14250	0.07592	0.00563	0.16950	-0.05992	0.14743	0.35258
C 14	0.17173	0.04634	0.13668	0.10259	-0.05623	0.01254	0.00505
C 15	0.15622	-0.11779	0.11734	0.05424	-0.03990	-0.24305	-0.18734
C 16	0.10401	-0.10110	0.00926	0.08833	-0.06735	-0.42434	0.02157
C 17	0.16203	0.07437	0.30334	-0.10663	-0.09443	-0.01215	0.00216
C18	0.17267	-0.04648	0.19626	-0.16157	-0.06156	0.19431	0.05279
C 19	0.16168	-0.03505	0.25021	-0.26064	-0.00304	0.01617	-0.03650
C 20	0.10892	0.01704	0.20129	-0.43159	0.12894	-0.02706	-0.05635
C 21	0.20536	-0.11729	0.15758	-0.06798	-0.06013	-0.25374	-0.06238
C 22	0.17792	-0.14406	0.04687	-0.09410	0.08744	-0.14435	-0.17350
C 23	0.15888	0.18409	-0.04269	-0.13258	-0.16195	0.16812	0.08339
C 24	0.14894	0.03292	-0.18337	-0.13548	-0.14390	0.17675	-0.02918
C 25	0.17590	-0.15083	0.00986	0.01021	-0.14747	0.27267	-0.17091
C 26	0.15491	-0.04932	-0.04303	0.13721	-0.29665	0.09388	-0.07149
C 27	0.14967	0.19953	0.08084	-0.05533	-0.04608	0.12945	0.01708
C 28	0.17547	0.20226	-0.14311	0.00226	-0.15466	0.13090	0.00732
C 29	0.18956	-0.10494	-0.12320	0.02774	-0.11277	-0.04540	-0.01376
C 30	0.07906	0.33285	-0.01600	-0.13625	0.10377	0.01838	-0.14527
C 31	0.17537	-0.02913	-0.07425	0.14971	0.33902	0.02515	-0.10559
C 32	0.13502	0.18935	-0.20585	-0.08435	0.13953	0.01997	-0.10065
C 33	0.17179	0.06758	-0.21632	0.14939	0.29978	-0.07066	-0.03739
C 34	0.16116	-0.04184	-0.29925	0.02349	0.21633	0.07506	0.08659
C 35	0.16942	0.18192	-0.05799	0.04284	-0.03868	-0.00992	0.00783
C 36	0.19248	0.07172	-0.18145	-0.16935	0.04903	-0.05742	-0.01673
C 37	0.16869	0.00354	-0.17730	-0.16580	0.11998	-0.04777	0.14098
C 38	0.04735	-0.16029	-0.30289	-0.17933	0.02727	0.17086	0.07823
C 39	0.11347	0.19644	-0.12757	0.04580	0.18329	-0.11891	-0.07356
C 40	0.13318	0.08874	0.03646	0.16728	-0.04027	-0.32731	0.01124
C 41	0.17818	-0.13056	-0.00859	0.07523	-0.02399	0.00206	-0.26488
C 42	0.08721	-0.25051	0.20542	0.09419	0.12930	0.13853	-0.04507
C 43	0.15150	-0.12829	-0.01932	0.00999	-0.18851	0.28116	-0.31744
C 44	0.18103	-0.22986	-0.14062	-0.05088	-0.04915	-0.18688	0.02186
C 45	0.20298	-0.07099	-0.09728	0.02926	-0.14844	-0.15717	0.13508

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