FEATURES PERCEIVED AS IMPORTANT BY THE JAPANESE AUTOMOBILE OWNERS AND POTENTIAL BUYERS

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Abstract

The U.S. automobile market is highly competitive and one can buy vehicles made in any of the industrialized nations. Approximately one-in-three automobiles sold are either imported from abroad or produced in the U.S. by the foreign investors who own and operate plants. Among the foreign vehicles sold, Japanese have the largest market share followed by the Europeans and South Koreans. Automobile manufacturers wanting to be successful in the U.S. market should focus upon customer satisfaction by finding out what the owners and potential buyers want in a car. This study was designed primarily to determine features perceived as important by the owners of Japanese automobile and potential buyers. A survey of 200 households located in Bakersfield and suburbs was conducted using personal interviewing method during February-March 1999. Data pertaining to the respondents showed that the majority were female, either married/single, belonged to 49/ less age group, had college education, hand one child/two children, held white/blue collar jobs, predominantly white with an annual household income ranging between $25,000 to $75,000. The majority of respondents lived in Southwest, Northwest, and North Bakersfield. Discriminant analysis for households with one car and owning a Japanese car identified 4 out of the 16 geographic, demographic, and socio-economic variables as important. Cross tabulation of the variables showed that the majority had college education; used the automobile for work, to run errands, and leisure activities; held white/ blue collar jobs; and lived in households with an annual income ranging between $25,000 to $75,000. Information related to profile of households with two car ownership with Japanese car showed that the majority of the spouses were 49 years/less in age; married/single; had college education; and lived in households with one child/two children. Analysis of data related to potential buyers identified 5 out of 16 characteristics related to the potential buyers. The majority of spouses belonged to 49 years/less age group; had college education; both the respondent and the spouse held white/blue collar jobs; and used the automobile for work, running errands, and leisure time activities. Of the 19 features rated by the respondents, the factor analysis generated only one factor with an eigenvalue of 13.3841 and a variation of 70.4%. The factor loading for the features ranged between 0.6501 for price of the automobile to 0.9043 for access to headlights. Based on the magnitude of the factor loadings, it is reasonable to conclude that the price is relatively less important compared to features representing convenience, reliability, fuel efficiency, and others.

1.Introduction

The U.S. auto industry lagged behind Tokyo in the global automobile production during the decade of the late 1970s and early 1980s. The Big3 were forced to respond to their loss of market share and increasing Japanese competition in the auto market by lobbying the U.S. government to impose quota on Japanese imports. Given the free-market philosophy of the American government, lobbying efforts by the Big3 failed. Consequently, the U.S. automobile industry invested huge sums of capital, time, and effort to find out how the Japanese were able to produce better quality cars in a cost-efficient manner. The finding was that the Japanese automobile manufacturers had highly automated production techniques and employed rigorous statistical quality control methods advocated by the late Dr. Edward Deming. Japanese workers took great pride in their workmanship and products. In addition, the management took a long-term approach to profits. The employees shared both policy- making aspects of management and profit derived by the company.

The U.S. auto industry, which supports in excess of 1.4 million jobs and generates an estimated $50 billion in wages, has great impact on the economy. Due to archaic manufacturing techniques, obsolete equipment, inadequate investment in research and development, lack of quality control methods, and poor labor relations, the U.S. automobile industry continued to decline and reached the bottom during 1970s. Emphasis on powerful engines and luxury in the automobiles manufactured by the Big3 resulted in inefficient and expensive automobiles with chronic mechanical problems. American automobiles on the road during 1970 were giving 14 miles a gallon of gasoline. This, however, declined to 12 miles for the 1973 models. The skyrocketing gasoline prices and potential for shortages due to the monopoly power of the Organization for Petroleum Exporting Countries (OPEC) created the need for the federal government to interfere. The federal energy policy mandated a fleet average of 18 miles per gallon for 1978 models and this had to be increased annually to reach 27.5 miles per gallon of gasoline by 1985. [1]

Lack of support from the U.S. government to impose quotas on Japanese imports forced the Big3 to improve manufacturing quality and efficiency to compete with the Japanese and other imports from Europe. By early 1990s, the U.S. auto manufacturers were successful in offering better quality cars at competitive prices. During 1993, the Big3 reported double-digit sales gain increasing the market share to 75%, up 4% compared to first four months of 1992. These gains were coming mostly at the expense of Japanese automobile makers. The market share for the Japanese automobiles in the U.S. declined from 26% in 1991 to 22% during May 1993. The reasons for declining Japanese automobile sales in the U.S. can be attributed to: (1) unfavorable exchange rate between the U.S. dollar and the Japanese Yen; and (2) higher prices. During 1993, the Japanese automakers increased the new vehicle prices on an average by 4% compared to 2.6% by the General Motors, 0.81% by the Ford Motor Company, and by 1.1% by Chrysler. Consequently, the price of a Japanese car went up by as much as $2,555 compared to the U.S. models. In addition, the Big3 improved quality and customer service substantially. According to a survey of 1,246 auto buyers conducted by Dohring Company in 1993, about 64% of the respondents stated that the U.S. made car quality was better or equal to that of the Japanese made autos.[2]

Realizing that the U.S. government may be forced to impose quotas on the Japanese imports, Japanese manufacturers began investing in setting up automobile manufacturing plants in the U.S. during late 1970s. So far, Japanese manufacturers have invested over $16 billion in the U.S.; operate 15 manufacturing plants, and 37 research and development centers across the country. Although Japanese automobiles are popular in the U.S., it is important to realize that the competition is getting keener in the U.S. automobile market. Several European manufacturers have invested in manufacturing automobiles in the U.S to grab the market share from the U.S. and Japanese manufacturers. In addition, during the second half of the 1990s, Daewoo and Kia, Korean made automobiles have entered the U.S. market. [3]

2. Review of Related Literature

A review of literature related to the automobile buying behavior, customer profile, and features perceived as important revealed a limited number pertaining to these areas. A study of automobile buyers profile by Peters showed that age and race of the head of the households, number of individuals below 18 years of age, and number of automobiles owned by the households affected the probability of purchase of imported automobiles. [4] The focus of a study by Lave and Bradley was on the ownership of imported automobiles. They found that education; closeness of the location of the households to the East and West coasts, and number of vehicles owned by households positively affected owning imported automobiles. [5] An investigation of relationship between household income and probabilities of buying a foreign automobile showed that high-income households are more prone to buy a compact foreign car. [6] A multiple classification analysis by Carroll and Green revealed that the age of the household heads and absence of children in the household affected the demand for foreign automobiles. [7] Data related to the new small cars from the 1972 Consumer Expenditure Survey were analyzed by Dardis and Hrozenick. The results showed that the coefficients of price and income were statistically significant compared to those obtained for age and marital status. Households whose heads were over 45 years of age and married were less likely to buy imported automobiles. The characteristics of households more like to buy imported automobiles were as follows -- the heads of households were between 35 to 44 years of age, single, educated, female, and living in urban West. An examination of the impact of prior ownership on the probabilities of buying foreign cars showed that households selling or trading-in foreign cars were more likely to buy imported automobiles. [8]

Analysis of data related to Japanese automobile buying by Hussein using cross-classification method showed that households were willing to pay a higher price for Japanese cars. According to the study, given the size, preference for Japanese automobiles was less likely by women compared to men. [9] Another study by Shwartz and Stone using cross-classification of geographic, demographic, and socio-economic data revealed that those living in metropolitan areas were more apt to buy foreign automobiles. It also showed that they were young, single, female, and college educated. [10] According to Lin, an increase in real disposable income contributed to an increase in imported automobile sales. [11] Income was also significant in the study by Wetzel and Hoffer. They used time series data to analyze the demand for various types of automobiles including those that were imported. [12] A study by Dardis and Ferrer using two-stage probit analysis investigated five automobile attributes -- cost of repair, frequency of repair, and miles per gallon, weight, and depreciation. These attributes represented the automobile quality. Analysis of data from the households that had purchased new automobiles showed that Japanese automobiles did well in four of the five quality attributes. Households were interested in more fuel-efficient heavier automobiles with lower depreciation rates and lower frequency or repairs. Since these four features were most often found in Japanese automobiles, the study concluded that the households were likely to buy Japanese rather than the non-Japanese automobiles. [13] A survey of 201 households conducted in Bakersfield and suburbs during 1994 showed that 90% of the households responding indicated that the quality of U.S. cars had greatly improved over the past ten years. Answers to the question about the automobile they intend buying revealed that 64% wanted to buy American, 30% said Japanese; and the remaining 6% stated that they would like buy European made automobiles. [14]

Automobile quality is an important feature in making decision whether to buy a car. The success of Japanese automobiles in the U.S. market from the very beginning can be traced back to quality, workmanship, and fuel efficiency. Japanese automobiles had better repair record compared to those made in Detroit during the early to mid-1980s. [15] Although the quality of the U.S. made cars has improved substantially during the 1990s, perception that they are inferior to Japanese automobiles still continues. [16] During 1987-1988, automobiles produced in Detroit had 89 defects per 100 cars compared to 47 per 100 cars made by Japanese. [17]

The 1998 Vehicle Dependability Study by J.D. Powers and Associates conducted a survey of over one million original and second owners of 1992-model year automobiles. According to the survey results Lexus retained number one rating in 1998 for the fourth year in a row. The respondents rated vehicles on 89 problem categories covering one-year period of ownership. The objective of the study was to provide information to the automobile manufacturers how to improve the overall reliability and dependability over the long run. Of the 19 automobiles included in the study, ratings for 7 Japanese cars ranged from 167 to 391. Rating for these automobiles were as follows: (1) Lexus -- 167; (2) Infinity --273; (3) Acura -- 281; (4) Toyota -- 313; (5) Honda -- 341; (6) Subaru -- 360; and (7) Nissan --391. Lower rating indicates that the automobile was more dependable. The average rating for the industry was 399. [18]

The Initial Quality Study 2 by J.D. Powers and Associates obtained information from 41,004 owners of 1999 model-year vehicles. The Initial Vehicle Quality is a measure of problems-per 100 vehicles covering 135 specific problem areas grouped into 9 categories. Analysis of the data revealed that Toyota captured 8 awards. Those at the top of the Initial Quality were -- Toyota Corolla4Runner, Land Cruiser, and Sienna. For three years in a row, LexusLS400 set the distinction as the best Premium Luxury automobile. In the Premium Mid-size category, the General Motor captured the top three positions led by Chevrolet Lumina. This was the first-ever Initial Quality award for the General Motors. The U.S.-built Nissan Altima captured the top award for the Mid-size segment. [19] Another survey of 88,000 new vehicle owners by J.D. Power and Associates to determine the new vehicles feature and design was conducted during 1999. Analysis of the data showed that Volkswagen, General Motors, and Toyota had the greatest number of new vehicle models considered by customers as “most appealing.” [20]

The studies discussed so far indicate that geographic, demographic, and socio-economic profile play an important role in automobile ownership and purchase decisions. In addition, quality, dependability, appeal, and other features perceived as important also play an important role. It is essential, therefore, that the Japanese automobile manufacturers focus on features perceived as important to satisfy the owners and potential buyers of automobiles. Customer satisfaction may ultimately help retain the market share, and even grow in a highly competitive U.S. automobile market.

3. Problem Statement and Objectives

In the U.S automobile market European, Japanese, South Korean, and the U.S. manufacturers want to maintain their market share, and if possible gain from others. To minimize the competitive pressure and maintain market share the automobile manufacturers are getting into various forms of alliances for pooling resources. [21] Research and new product development may also help attracting potential automobile buyers attention. In 1999, Japan’s Honda Motor Company introduced “Honda Insight,” a hybrid-electric vehicle. Toyota Motor Corporation introduced “Prius” hybrid-electric sedan the same year. In response to this, Ford Motor Company has planned to market hybrid-electric Sports Utility Vehicle “Escape HEV” in 2003. [22] In addition, it is vital that these firms focus on what the customer wants. Offering the features perceived as important in an automobile may motivate the customers in buying the automobile irrespective of the make. This study was designed primarily to determine features perceived as important by the owners and potential buyers of Japanese vehicles The specific objectives, however, were to determine: (1) the geographic, demographic, and socioeconomic profile of respondents; (2) number of automobiles owned, make, and the year; (3) profile of Japanese automobile owners; (4) profile of potential buyers of Japanese automobiles; and (5) features perceived as important in the Japanese automobiles.

4. Methodology and Model

A two-page questionnaire was developed and used to gather information related to the objectives of the study. Questions included were related to the geographic, demographic, and socio-economic characteristics of the respondents; types and number of vehicles owned; usage of vehicles; what automobile would they choose when they buy their next car -- Japanese or American; and the price they were willing to pay for the vehicle they intend buying. In addition, 19 features perceived as important in making automobile purchase decision were also included. The features were selected by conducting an exploratory survey of the automobile owners. These features were: price; reliability; size; appearance; fuel economy;

customer service; warranty; safety; acceleration; performance; legroom; headroom; access to stereo and CD player, headlights, windshield wiper, air conditioner, cruise control, braking, and maneuverability. The respondents were asked to rate the features perceived as important on a 5 point scale in which 5 was most important and 1, the least important. A survey of 200 households was conducted in Bakersfield and suburbs during February – March 1999 using personal interviewing technique. Following the completion of the survey, data were computerized and analyzed using SPSSx package.

Descriptive statistical analysis was used to identify the geographic, demographic, socio-economic, automobile ownership, automobile the respondents intend buying, and the price they were willing to pay. To determine the profile of Japanese automobile owners and potential buyers simple linear discriminant model of the following form was used.

$$Z = b_1 x_1 + b_2 x_2 + \ldots + b_n x_n \qquad (1)$$

Where:

Z = Discriminant score

$b_1 \ldots b_n$ = Discriminant weights/coefficients

$x_1 \ldots x_n$ = Predictor variables

In the stepwise discriminant analysis, responses to the type of automobiles owned and the type of car the respondent would like to buy were used as criterion variables. The predictor variables represented the16 geographic, demographic, and socio-economic characteristics of the respondents. Following the analysis Standardized Canonical Discriminant Coefficients were ranked on the basis of their absolute magnitude. Only those characteristics with a coefficient of $\geq \pm 0.30$ in magnitude were considered as important. To determine the classification power of the discriminant function C_{pro}, the Proportional Choice Criterion was used. [23]

$$C_{Pro} = P^2 + (1 - P)^2 \qquad (2)$$

Where:

P = Proportion of respondents belonging to group 1

(1 – P) = Proportion of respondents belonging to group 2

Factor analysis with varimax rotation was used for identifying features perceived as important by the respondents and labeling the factors generated. The analysis is an interdependent technique in which all 19 features are considered simultaneously. Each of the features perceived as important. by the respondents is treated as a dependent variable that is a function of some underlying, latent and hypothetical set of factors. Conversely, one may also consider each factor as a dependent variable that is a function of features perceived as important. The objective of factor analysis is to find a way to condense the information contained in a number of automobile features perceived as important into a smaller set of new composite factors. Given the factor loadings, a decision has to be made with regard to the number of factors to be extracted When a large number of features are involved, the largest and best combinations of features is extracted first followed by smaller, less meaningful combinations. In general, factor matrix is used for selecting factors with significant factor loadings. Factor loadings $\geq \pm 0.30$ are considered as significant. The factor analysis model used was as follows. [24]

$$Z_j = a_{j1}F_1 + a_{j2}F_2 + \ldots + a_{jm}F_m + d_j U_j \; ; \qquad j = 1, 2, \ldots n \quad (3)$$

Where:

Z_j = Feature j in standardized format

F_1 = Hypothetical factors

U_j = Unique factor for feature j

a_{j1} = Factor loadings

d_j = Standardized regression coefficient of feature j on unique factor j

5. Findings

5.1 Geographic, Demographic and Socio-Economic Profile of Respondents

Responses to the questions on geographic, demographic and socio-economic characteristics of the respondents were analyzed using descriptive statistics -- frequency analysis. Results of the analysis are presented below. The numbers presented in the parenthesis represent number of responses.

1. **Sex** (n=199): (a) Male -- 47%; (b) Female -- 53%
2. **Marital Status** (n=196): (a) Married -- 49%; (b) Single -- 51%. The category single included those living alone, divorced, and widowed
3. **Respondents' Age** (n=194): (a) 17 to 25 years –--40%; (b) 26 to 40 years -- 28%; (c) 41 to 76 years -- 32%. The average age was 34.1 years with a standard error of 1.01. The median and modal ages were30 and 22 years, respectively.
4. **Spouses' Age** (n=90): (a) 23 to 35 years -- 29%; (2) 36 to 49 years -- 43%; (c) 51 to 86 years -- 28%. The average age was 43.94 years with a standard error of 1.46. The median and modal ages were 41 and 34 years, respectively.
5. **Respondents' Education** (n=197): (a) Some High School/ High School Graduate -- 21%; (b) Some College/ College Graduate -- 72%; (c) Professional degree/others -- 7%
6. **Spouses' Education** (n=86): (a) Some High School/High School Graduate -- 27%; (b) Some College/College Graduate -- 55%; © Professional degree/others -- 18%
7. **Respondents' Occupation** (n=193): (a) White collar -- 18%; (b) Blue collar -- 36%; (c) Student and others -- 46%
8. **Spouses' Occupation** (n=87): (a) White collar --20%; (b) Blue collar --49%; (c) Student and others --31%
9. **Number of Children in the Household** (n=100): (a) 1 child -- 32%; (b) 2 children --33%; (c) 3or more children -- 35%
10. **Respondents' Ethnicity** (n=188): (a) White -- 57%; (b) Hispanic -- 23%; (c) Asian -- 11%; Others -- 9%
11. **Spouses' Ethnicity** (n=82): (a) White -- 69%; (b) Hispanic -- 21%; (c) Asian -- 6%; (d) Others -- 4%
12. **Annual Household Income** (n=153): (a) 900 to 25k --31%; (b) 26k to 50k --38%; (c) 51k to 75k -- 16%; (d) 80k and over -- 15%. The average income of the household was $43,362 with a standard error of 22.28. The median and modal incomes were $38,000 and $30,000, respectively
13. **Geographic Location of the Household**(n=194): (a) Southwest -- 40%; (b) North west -- 8%; (c) North -- 8%; (d) Other areas -- 44%.

5.2 Automobile Ownership, Make, and Year

Questions related to whether the individuals rented, leased, or owned the automobiles, make of the automobile, and the year of the automobile make were asked to determine the type of ownership, whether the automobile owned was Japanese make, the year in which the automobile owned was made. Responses provided are presented below.

1. **Automobile Ownership** (n=190): (a) Lease,/Rent -- 8%; (b) Own -- 92%
2. **Automobile Make** (n=324, number of responses exceed the sample size of 200 since some households owned more than one automobile): (a) Japanese -- 31%; (b) American (Ford and GM) -- 42%; (c) Others -- 27%
3. **Year of the Automobile** (n-322): 1942 to 1985 -- 23%; (b) 1986 to 1990 -- 21%; (c) 1991 to 1995 -- 33%; (d) 1996 to 1999 -- 23%

5.3 Demographic and Socio-Economic Profile of Japanese Automobile Owners

To determine the profile of Japanese automobile owners simple linear discriminant model was used. Since most U.S. households own two or more cars, it was interesting to determine how many households with one and two cars owned Japanese cars. Answers given to the automobile ownership question were categorized into two groups: (1) Japanese automobile owners; and (2) Those owning other automobiles. A total of 194 households with one automobile provided information. Of this number, 36% said that they owned a Japanese car and the rest, 64% mentioned that they owned an American made car. These responses were used as criterion variable, and 16 geographic, demographic, usage, and socio-economic variables were used as predictor variables. Results of the discriminant analysis are shown in Table 1 to Table 4.

Table 1 Standardized Canonical Discriminant Function Coefficients: Profile of Japanese Automobile Owners In Households With One Car

Variable	Coefficient	Rank
1. Respondents' Education	0.6257	1
2. Automobile Usage	-0.5531	2
3. Respondents' Occupation	0.4931	3
4. Annual Household Income	0.4062	4

Functions derived = 1;c = 12.68; D.F. = 5; a **= 0.02**

Information provided in Table 1 show that the discriminant function was statistically significant with an estimated χ value of 12.68 and an α of 0.02. Of the 16-predictor variables only 4 were identified as important. In the order of ranking, these variables were: Respondents' education, Use of the automobiles by the households, Respondents' education, and the Annual household income. Cross tabulation of the data showed that the majority of the respondents had college education;

used the automobile for work, to run errands, and leisure time activities; held white/blue collar jobs; and belonged to households with an annual income ranging between $25,000 to $75,000.

Table 2 Classification Matrix: Predictive Validity Related to Japanese Automobile Ownership In House Holds With One Car

Actual Group	No. Cases	Predicted Group Membership	
		Group 1	Group 2
Group 1-- Japanese autos	69	45 or 64.2%	24 or 34.8%
Group 2 -- Other autos	125	52 or 41.6%	73 or 58.4%

Group members correctly classified:68.82%; C_{pro} = 52.40%

Classification matrix showing how many Japanese automobile owners were correctly classified by the discriminant function is presented in Table 4. It is important to recognize that using discriminant function for purposes of classification helps in minimizing the probability of incorrect or misclassification. However, one has to pose the question whether the incorrect or misclassification has been reduced to a sufficient extent to make it a useful tool. According to Morrison "… The statistical significance per se of the D^2 or transferred F statistic means very little … (it) is a very poor indicator of the efficacy with which the independent variables can discriminate between group 1 individuals and those in group 2." [25] In this study, C_{pro} is 52.4%. The actual percent of correct classification, 68.82%, that is higher than Cpro, shows that the discriminant function has classification power.

Table 3 Standardized Canonical Discriminant Function Coefficients: Profile of Japanese Automobile Owners In Households With Two Cars

Variable	Coefficient	Rank
1. Spouses' age	0.7153	1
2. Marital status	-0.5059	2
3. Spouses' education	0.4121	3
4. Whether vehicle used for children	0.3694	4

Functions derived = 1; c = 21.71; D.F. = 4; a = 0.00

Table 4 Classification Matrix: Predictive Validity Related to Japanese Automobile Ownership In House Holds With Two Cars

Actual Group	No. Cases	Predicted Group Membership	
		Group 1	Group 2
Group 1-- Japanese autos	28	21 or 75.0%	7 or 25.0%
Group 2 -- Other autos	72	19 or 26.4%	53 or 73.6%

Group members correctly classified: 74.00%; C_{pro}= 59.68%

Households owning two cars accounted for 100. Those owning Japanese cars represented 28%, while the remaining 72% owned American made automobile. Result of discriminant analysis is presented in Table 3. Information provided in the table show that the discriminant function was statistically significant with an estimated χ value of 21.71 and an α of 0.00. Of the 16-predictor variables only 4 were identified as important. In the order of ranking, these variables were: Spouses' age; Martial status of the respondent; Spouses' education; and whether the vehicle was used for carrying on the activities related to children. Cross tabulation of the data showed that the majority of the spouses were 49/less in age, married/single, had college education, and lived in households with 1 child /2 children

Classification matrix presented in Table 4 shows how many Japanese automobile owners were correctly classified by the discriminant function. In this study, C_{pro} is 59.68%. The actual percent of correct classification 74.00% being greater than Cpro, it is reasonable to conclude that the discriminant function has classification power.

5.4 Profile of Potential Japanese Automobile Buyers, Price They Are Willing to Pay and Reasons for Buying

To find out the make of car respondents may like to buy, price they are willing to pay, and reasons for choosing a particular make of car, three questions were asked. Responses to the question about what automobile they intend to buy were given by 182. Of the 182, 53% said that they would buy a Japanese automobile and the remaining 47% expressed their intention to buy an American car. Answers to the question how much they are willing to pay for the car were provided by 182. The average price they were willing to pay was approximately $22,435 with a standard error of 9.47. The median

and modal prices were $20,000, each. A total of 152 individuals gave reasons for buying their next car. The reasons given were as follows: (1) support the U.S. economy --11%; (2) affordability of the car -- 16%; (3) reliability of the car -- 29%; (4) preference for a particular make -- 21%; (5) other reasons like quality, personal liking -- 23%. Responses provided show that only a small percent representing only 11% stated that they would buy an American automobile to support the economy. The rest, representing 89% gave reasons directly related to the automobile features.

To determine the profile of potential Japanese automobile buyers answers provided to the question on what make of automobile they intend buying was classified into two groups -- Japanese and American. Of the 182 responding to the question, 96 stated that they would like to by a Japanese car while the remaining 86 expressed their intention to buy an American automobile. In the discriminant analysis these answers were used as criterion variable and the 16 geographic, usage, and demographic and socio-economic characteristics were used as predictor variables. Result of the discriminant analysis is provided in Table 5 and table 6.

Table 5 Standardized Canonical Discriminant Function Coefficients:
Profile of Potential Japanese Automobile Buyers

Variable	Coefficient	Rank
1. Spouses' age	0.8404	1
2. Respondents' education	0.6129	2
3. Spouses' occupation	- 0.4770	3
4. Respondents' occupation	0.4555	4
5. Usage of the automobile	-0.3490	5

Functions derived = 1; c = 21.52; D.F. = 4; a = 0.00

The discriminant function identified 5 out of the 16 predictor variables as important was significant with an estimated χ. value of 21.52, 4 degrees of freedom, and a α of 0.00. Cross tabulation of the data related to the variables identified as important showed that the majority of the spouses were in less than 49 years age category, had college education, held white/blue collar jobs, and used the automobile for work, running errands, and leisure time activities.

Table 6 Classification Matrix: Predictive Validity Related to Japanese Automobile Ownership In House Holds With One Car

Actual Group	No. Cases	Predicted Group Membership	
		Group 1	Group 2
Group 1-- Japanese autos	96	54 or 56.3%	42 or 43.8%
Group 2 -- American autos	86	25 or 29.1%	61 or 70.9%

Group members correctly classified: 63.19%; C_{pro} = 50.15%

Classification matrix presented in Table 6 shows how many Japanese automobile owners were correctly classified by the discriminant function. The actual percent of correct classification, 63.19% is higher than Cpro of 50.15%. Therefore, it is reasonable to conclude that the discriminant function has classification power.

5.5 Features Perceived As Important By The Potential Japanese Automobile Buyers

In a highly competitive U.S. automobile market Japanese have to compete with the cars made by American, European, and South Korean manufacturers in terms of quality, price, and availability of makes ranging from pickup trucks to luxury cars. In addition, the automobiles marketed in the U.S., whether exported from Japan or made by Japanese companies in the U.S. must offer features perceived as important by the potential buyers. To determine features perceived as important by the Japanese automobile buyers 19 features were included in the questionnaire. These features were: (1) Price; (2) Reliability; (3) Size; (4) Appearance; (5) Fuel economy; (6) Customer service; (7) Warranty; (8) Safety; (9) Acceleration; (10) Performance; (11) Leg room; (12) Head room; (13) Access to stereo and CD player; (14) Access to headlights; (15) Access to windshield wiper; (16) Access to air conditioner; (17) Access to cruise control; (18) Braking; and (19) Maneuverability. The respondents were to rate the features on a 1 to 5 point scale in which 5 was most important and 1, least important. Data were analyzed using descriptive statistics to estimate arithmetic mean, standard error of the mean, median, and modal ratings of the features. To test the consistency of rating Spearman Correlation Coefficients were estimated. Features perceived as important were identified using factor analysis model with varimax rotation. Result of descriptive statistics derived is presented in Table 7.

The mean ratings for the 19 features presented in Table 7 show that 9 out of 19 had arithmetic means ranging from 4.02 to 4.32 and standard errors ranging from 0.06 to 0.07. These mean ratings indicate that the majority rated the 9 features between important to most important. To find out whether the respondents were consistent in rating the features, Spearman Correlation analysis was done. The analysis resulted in Correlation Coefficients ranging from 0.3118 to 0.7533 for the rating of all 19 features. The Correlation Coefficients were significant at a α level of 0.00 for all the features. It is reasonable to conclude, there fore, that the respondents did rate the features based on what they perceived as important in Japanese automobiles

Table 7 Rating of Features Perceived As Important In A Japanese Automobile

Feature	n*	Mean	Std.Er**	Median	Mode
1. Price	185	3.64	0.07	4	3
2. Reliability	188	4.23	0.07	4	5
3. Size	186	3.51	0.07	4	4
4. Appearance	187	4.05	0.07	4	5
5. Fuel economy	187	4.32	0.06	5	5
6. Customer service	182	3.69	0.08	4	4
7. Warranty	180	3.84	0.07	4	3
8. Safety	185	3.81	0.07	4	4
9. Acceleration	184	3.80	0.07	4	4
10. Performance	186	4.02	0.06	4	4
11. Leg room	187	3.52	0.07	4	3
12. Head room	186	3.43	0.08	3	3
13. Stereo & CD player	183	3.97	0.07	4	4
14. Headlights	184	4.08	0.07	4	5
15. Windshield wiper	184	4.00	0.07	4	5
16. Air conditioner	185	4.08	0.07	4	5
17. Cruise control	181	4.03	0.06	4	4
18. Braking	184	4.03	0.07	4	4
19Maneuvereability	186	4.14	0.07	4	5

n* = number of responses; Std. Er. = Standard error of the mean**

The 19 features rated by the respondents were subjected to factor analysis with varimax rotation. Since only one factor was extracted the solution could not be rotated. Results of the factor analysis were as follows: Factor extracted, = 1; Eigenvalue = 13.3841; Percent variation = 70.4. Factor loadings for the features representing the factor generated in the descending order of magnitude are as follows: (1) Access to headlights -- 0.9043; Braking -- 0.8994; (3) Access to stereo and CD player -- 0.8824; (4) Access to windshield wiper -- 0.8823; (5) Access to air conditioner – 0.8681;
(6) Performance – 0.8612; (7) Safety -- 0.8703; (8) Maneuverability -- 0.8537; (9) Warranty -- 0.8437;
(10) Access to cruise control -- 0.8404; (11) Size -- 0.8384; (12) Legroom -- 0.8329; (13) Reliability -- 0.8270;
(14) Appearance -- 0.8227; (15) Fuel economy -- 0.8212; (16) Head room -- 0.8205; (17) Acceleration -- 0.7999;
(18) Customer service -- 0.7962; (19) Price -- 0.6501. High factor loadings of the features perceived as important indicate that the respondents perceived all 19 features as important, some more important than the others.

Those features with higher factor loadings may be interpreted as relatively more important compared to those with lower factor loadings. For example, access to headlights may be considered as more important than price. The reason for this perception could be that the Central Valley of California has foggy weather conditions from December through the end of March and some time the fog is very thick. Driving under foggy weather conditions calls for halogen headlights that can be accessed easily. Price may have been perceived as less important because the competitive environment in the U.S. automobile market leaves little room for charging exorbitant prices. The price of a typical compact car may range between US$ 20,000 to $25,000 with little or no room for bargaining. Based on the magnitude of factor loadings, the features perceived as important can be grouped into three main categories -- Safety, Convenience, and Comfort.

6. Summary and Conclusion

The U.S. free–market economy attracts foreign products and investors. This is typically true of the U.S. automobile market. One can buy automobiles made in Europe, Japan, and South Korea, wither imported or made by the foreign owned firms located in the U.S. Approximately one-third of the automobiles sold in the U.S. are foreign brands. The competitive environment in the U.S. automobile market has created the need to maintain market share by each firm, and if possible, cut into others. Focusing on automobile owners and potential buyers needs and offering them what they desire in an automobile can accomplish this. This can be done through research and new product development and offering features
perceived as important in making purchase decision. This study was designed primarily to determine features perceived as important by the Japanese automobile owners and potential buyers. In addition the investigation also focused on the

geographic, demographic, and socioeconomic profile of respondents, Japanese automobile owners, and potential buyers. To the accomplish the objectives, a survey of 200 households was conducted during February – March 1999. Analysis of the data showed that the martial status; spouses' age; respondents' and spouses' education; respondents' occupation; number of children; annual household income; and usage of the automobile as important for the Japanese automobile owners. For the potential buyers, the following characteristics were important -- spouses' age; respondents' education; respondents' and spouses' occupation; and usage of automobile. Factor analysis of the 19 features included in the study generated only one factor with factor loadings ranging from 0.6501 for price of the automobile to 0.9043 for access to headlights. As a result, it is reasonable to conclude that price is relatively less important compared to other features. The Japanese automobile manufacturers may focus on these features and on the customer profile found in this study.

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