

## **Identifying Purchase Driving Attributes and Market Segments For PCs Using Conjoint and Cluster Analysis**

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**Abstract.** Delivering superior customer value is crucial to business success in competitive markets. Among other things, this involves identifying and understanding your customers, their needs, wants, and product preferences. Identifying and understanding your customers relates to market segmentation and target marketing. Knowing their product preferences involves identifying key product attributes and the importance of the attributes that drive their product preferences. Conjoint analysis is a useful multivariate statistical technique for identifying product attributes and the levels that influence product choice. Cluster analysis can be used to identify market segments with similar product attribute benefit affinities. This study illustrates the application of conjoint analysis for determining the relative importance of personal computer attributes and the levels of these attributes that are choice influential. In addition, cluster analysis is used to recognize the product benefit related market segments for personal computers. Finally, the findings and limitations of this research are discussed.

**JEL Classification Codes:** M310.

**Keywords:** Conjoint Analysis; Segmentation; Cluster Analysis; Customer Satisfaction; New Product Development.

### **Introduction and Objectives**

There is a sizeable body of literature related to the competitive advantage and success of firms. In this regard, the contributions of Michael Porter (1985), Hamel and Prahalad (1994), Tom Peters (1985), and Treacy and Wiersema (1995) have gained much attention. Although a review of this literature is beyond the scope of this paper and not necessary given its focus, it is useful to note that there are several sources of competitive advantage and paths leading to success that can be adopted by firms. For the most part these are (1) low-cost

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leadership, (2) differentiation, (3) product innovation, and (4) market focus. Underlying all of these sources of competitive advantage is the ability of a firm to deliver superior customer value. Superior customer value can be based on low price, successfully differentiated products, and on innovative products that have strong market appeal. Superior customer value may also be the outcome of a focus strategy that enables a firm to excel in meeting the needs of a narrow segment of the market.

Being "market-oriented" is also oftentimes associated with business success. Numerous empirically based studies indicate a strong positive relationship between market orientation and a firm's profitability, customer retention, sales growth, and new product success (Kohli and Jaworski, 1992, and Raju, Lonial, and Gupta, 1995). Being market-oriented places a strong emphasis on the creation and delivery of superior customer value. As noted by Slater and Narver (1994: 22), "a business is market-oriented when its culture is systematically and entirely committed to the continuous creation of superior customer value."

To better serve the customer and create superior customer value it is most helpful to know who the customer is and what the customer wants. The question of who the customer is relates to market segmentation and target marketing and the question of what the customer wants to identifying product attributes and their relative importance to the customer or market segment being targeted. Thus, instrumental in the creation of superior customer value can be segmenting a market and identifying appropriate target segments along with finding out the relevant product attributes that appeal most to these segments. Not surprisingly, market segmentation and product positioning have received a great deal of attention in marketing and have generated a very sizeable body of research literature. An attempt to cite this literature here would result in many sins of omission, nevertheless for a good understanding of market segmentation and product positioning the reader may want to refer to the work of Dickson (1987), Myers (1996), and Michman (1991).

Conjoint analysis is a statistical technique well suited to product development and product positioning strategy. It assists in the bundling of product attributes that will enhance the appeal of a product to a given market segment. Cluster analysis is a statistical technique that can be used for identifying market segments. Conjoint analysis and cluster

analysis are complimentary when used in tandem for identifying product attributes that drive product preference and for identifying consumer segments that are most likely to respond positively to these attributes. With this in mind, this paper focuses on:

1. The use of conjoint analysis to identify the most relevant attributes of personal computers (PCs) and the relative importance of these attributes in influencing the purchase of PCs.
2. The use of cluster analysis for identifying the key benefit segments in the university/college market for PCs.

### **Analytical Techniques and Methodology**

The two statistical techniques used in this study were conjoint analysis and cluster analysis. The first part of the study focused on using conjoint analysis to determine the relative importance of PC attributes in influencing the choice/purchase of a PC for a sample of college students in a major city in Turkey. The second part relates to the use of cluster analysis for identifying benefit-based market segments for PCs in this sample. Both of these statistical techniques and their applications are explained next.

### **Conjoint Analysis**

Conjoint analysis is a measurement technique that draws from mathematical psychology and psychometrics. It can be applied to determining the relative importance of the many attributes of a product to consumers. This capability makes conjoint analysis a very useful tool for product development and/or repositioning (Green and Wind, 1975). Although in this study conjoint analysis was used to determine the relative importance of various PC attributes that influence the purchase of a PC, the technique is also well suited to identifying market segments based on product attribute preferences and the related benefits (Green and Krieger, 1991). Green, Carroll, and Goldberg (1981) demonstrated how conjoint analysis could be used to help marketing managers determine which qualities of a product or service are most important to the consumer. Green and Srinivasan (1990) addressed the various uses and implications of conjoint analysis in marketing. The relationship

between product development and positioning and market segmentation and target marketing is symbiotic. Typically, when a new product is being developed or an existing one is being repositioned, two issues must be addressed. First, the nature of the product must be understood in terms of the salient attributes of the product and the relative importance of these attributes in influencing product or brand choice. Secondly, market segments of relevance for the new or repositioned product must be identified, evaluated, and the appropriate target market selected. Do segments exist that exhibit different levels of preference/importance or utility for the various product attributes or are such preferences homogeneous across market segments? Conjoint analysis can be used to provide answers to such questions. In addition, conjoint analysis examines the trade-off consumers make when selecting a product over other competing options. For example, in the case of personal computers (PCs), the technique assumes that a PC is a bundle of features or attributes, such as screen size, memory, or price. Each of these attributes can consist of several levels. For example, screen size may be 13, 15, or 17 inches and memory may be 64 or 128 megabits. Similarly, price may be \$1000, \$1500, or \$2000. The attributes used in conjoint analysis must be attributes that are important to purchasers when choosing among alternative products or brands. Similarly, the levels used must describe current or prospective products.

In conjoint analysis, purchasers are asked to evaluate several hypothetical products consisting of various combinations of product attributes and the related levels in terms of purchase preferences. When the number of attributes and the related levels are large, the numbers of all possible combinations representing the product alternatives will be too many for purchasers to evaluate. For example, the above PC scenario with three attributes and their designated levels would result in 18 possible combinations or product alternatives ( $3 \times 3 \times 2 = 18$ ). If a fourth attribute with three levels were added, 54 ( $3 \times 3 \times 2 \times 3 = 54$ ) combinations would be generated. When the number of combinations representing product alternatives gets too large, the cost of conducting a conjoint analysis study, as well as the fatigue and confusion experienced by the participants would be prohibitive. Fortunately, in such situations, the number of relevant combinations can be reduced significantly (without invalidating the conjoint analysis technique) through the use of an orthogonal array experimental design (Green, 1974). This procedure selects the test combinations so that the independent contributions of the selected attributes are balanced and

each attribute's weight or importance is retained. This reduced set of combinations representing hypothetical product alternatives is presented to consumers participating in the study. Typically, this is done in the form of individual cards representing each hypothetical product. Participants are then asked to rank these cards in terms of their own purchase preferences. Based on the evaluations of the hypothetical products made by the participants, conjoint analysis programs derive estimates of the utility function for each participating consumer. The utility function quantifies the relation between each consumer's overall evaluation of the product and the individual attributes of the product. The importance of a given attribute is calculated and expressed as the percentage of the total decision ascribed to that attribute. This percentage is the attribute's "part-worth." Thus, conjoint analysis can be used to determine the most desirable attribute configuration for a product.

### Cluster Analysis

Cluster analysis is a technique used for combining observations into relatively homogeneous groups or clusters. For example, cluster analysis can be used to group respondents into clusters representing respondents who are very similar on given measures of interest (Sharma, 1996: 187).

There are several clustering alternatives and related algorithms. Some of these relate to (1) selecting the appropriate measure of similarity, (2) choosing between a hierarchical or non-hierarchical clustering technique, and (3) specifying the number of clusters to be created and the distance measure to be used. A discussion of these issues is beyond the scope of this paper. However, interested readers can refer to a number of books that relate to multivariate statistical analysis, such as Sharma (1996) or Hair, Anderson, and Tatham (1995).

For this study Quick Cluster, from the SPSS statistical package, was used to cluster the study participants on the basis of the similarity of their utility functions for five PC related attributes and the corresponding attribute levels. When the individual utility functions of the student participants for the PC attributes are clustered, it is possible to identify PC related benefit segments and estimate their relative sizes. When these segments are viewed in tandem with the corresponding

product attributes of importance, appropriate target market segments can be selected, and the ideal products for these segments can be created and positioned.

### The Sample

The sample for this study consisted of 81 undergraduate and graduate students enrolled in the Economics and Administrative Sciences faculty at Fatih University in Turkey. Of these 81 students, 40 were males and 41 females. Of the 81 students, 61 had purchased a PC recently. The other 20 students were in the market to purchase a PC. Thus, the students sampled were very familiar with the various attributes of a PC and were in a good position to state their attribute related product preferences.

### Selection of Product Attributes

A critical decision in conjoint analysis is product attribute selection. If the attributes selected exclude attributes that are actually used by PC purchasers, then one will have spurious data on preferences and trade-offs and a meaningless set of findings from the conjoint analysis. To insure against this, focus group research involving students who had recently purchased a PC was conducted. The objective here was to gain a good understanding of PC attributes that were choice influential in the context of college students. As a result of this focus group research, 5 PC attributes and the related levels of each attribute were selected for conjoint analysis. These attributes, together with their levels, are shown below in Table 1.

TABLE 1: Personal Computer Attributes and Levels

Attributes	Level	
	Numbers	Description
Screen Size	1	13 inches
	2	15 inches
	3	17 inches
Price	1	\$1000
	2	\$1500
	3	\$2000
Memory	1	64 Megabyte

	2	128 Megabyte
Hard disk Driver	1	8 Gigabyte
	2	10 Gigabyte
Processor Chip	1	Pentium II
	2	Pentium III

Determining the precise number of attributes and the related levels for conjoint analysis is not an easy task. In addition to capturing the most important attributes and the related levels, one must also accommodate the imperatives of statistical reliability as well as take into account the practical consideration of the fatigue and capabilities of the participants. In selecting the number of variables and the related levels shown in Table 1, we were guided by the literature that addresses these issues (Wittink, 1989).

**Other Considerations Related to the Approach and Protocols**

With five attributes and the corresponding levels for each of these attributes, the total number of product configurations is 72 ( $3 \times 3 \times 2 \times 2 \times 2 = 72$ ). Clearly, for each of the 81 participants to rank these 72 product configurations in terms of their personal preferences would be daunting to say the least. In situations like this, the use of an orthogonal array experimental design is ideal to reduce the number of product configurations considered (Paul Green, 1974). Using the orthogonal array experimental design technique, the original set of 72 product configurations was reduced to a parsimonious set of 12 product configurations in which the independent contributions of all five attributes were balanced. Table 2 shows the 12 product configurations.

**TABLE 2: Experimental Design for Evaluation of a Personal Computer**

Product Configuration	Factors and Levels				
	Screen Size (Inches)	Price (US \$)	Memory (Megabytes)	Hard Disk Driver (Gigabytes)	Processor (Chip)
1	13	1000	64	8	Pentium II
2	13	1500	64	10	Pentium III
3	13	2000	128	8	Pentium II
4	13	1500	128	10	Pentium II
5	15	1000	64	10	Pentium III

6	15	1500	64	8	Pentium II
7	15	2000	128	10	Pentium II
8	15	1500	128	8	Pentium III
9	17	1000	128	8	Pentium III
10	17	1500	128	10	Pentium II
11	17	2000	64	8	Pentium II
12	17	1500	64	10	Pentium III

Twelve cards representing each of the 12 product configurations shown in Table 2 were prepared. Figure 1 illustrates two such cards.

**FIGURE 1: Product Configuration**

Card 1	Card 2
Screen size 13 inches	Screen size 15 inches
Price \$1000	Price \$1500
Memory 64 Megabytes	Memory 128 Megabytes
HDD 8 Gigabytes	HDD 8 Gigabytes
Processor Pentium II	Processor Pentium III

Data for the conjoint analysis using the *Full Profile* approach was collected from the 81 students participating in the study. This was done by groups of approximately 20 students. A *Full Profile* approach is less sensitive to minimal fractional factorial designs (i.e. the smallest possible subset of the total set of attributes). This facilitates the use of fewer product configurations (Reibstein, Bateson, and Boulding, 1988).

The purpose of the study and verbal details about the 5 attributes were carefully explained to each group. After describing the PC attributes and the related benefits each student in each group was given the 12 cards representing the 12 PC configurations and asked to rank the cards in order of purchase likelihood.

**Computing the Weights/Relative Importance/Utility Values of the Attributes**

A number of computer programs can be used to calculate the weights of each of the five PC attributes in terms of how important these attributes are in influencing choice. The rankings of the 12 cards representing the 12 PC configurations for the sample of 81 participants were entered into "Conjoint" a conjoint analysis program (Scott Smith, PC-MDS) that uses the Least Squares regression model. The additive model that adds up the values for each attribute to get the total value for a combination of attributes was used. The dependent variable was the rankings of the twelve specified combinations. The independent or predictor variables were the five attributes and their associated levels. These convert to seven dummy variables. The number of dummy variables is determined by subtracting one from the number of levels of each of the five attributes. For example, the attribute screen size had 3 levels, price had

3 levels, with Memory, Hard Disk Drive and Processor having 2 levels each. This yielded 7 dummy variables  $[(3-1)+(3-1)+(2-1)+(2-1)+(2-1)] = 7$ . This model can be represented as:

$$U = b_0 + b_1X_1 + b_2X_2 + \dots + b_7X_7$$

Where:

U = The dependent variable (rankings of the 12 combinations)

Xs = the seven dummy variables

b<sub>s</sub> = Calculated weights of the 5 attributes and related levels

b<sub>0</sub> = Constant

The computer program searches for a set of values for each level of the five attributes so that when these are added together the total utility of each combination corresponds to the original ranks. Furthermore, the conjoint analysis program finds a numerical representation of the weights for each level of the five attributes that indicates the relative importance of each attribute and the related levels. These weights are oftentimes referred to as "part-worth." The weights or part-worth indicating the relative importance of an attribute and its levels are calculated for each individual in the sample as well as for the sample as a whole. The conjoint technique thus obtains a utility function for each level of the five attributes at the individual level as well as for the aggregate sample.

With reference to the second objective of this study, namely that of identifying benefit segments in the sampled student population, it is worth noting that when the values of the utility functions of the individuals are clustered, it is possible to identify benefit segments. Furthermore, it is possible to estimate the relative sizes of these segments. In general, cluster analysis is a statistical technique for combining observations into relatively homogeneous groups called clusters. Thus, it was possible to cluster the students participating in this study in terms of the similarities in the benefits they desired when purchasing a PC. In this study, Quick Cluster, an SPSS clustering program, was used for grouping the student participants based on their utility values or part-worth for the five attributes related to PC preferences and purchase. Thus, students having similar utility values for the five attributes and their levels would cluster together; whereas students having different utility values would be classified into different clusters. The end result is that within clusters homogeneity and between clusters heterogeneity is maximized.

## Results

The first part of this section reports on the results related to the first objective of this research study, namely identifying the most relevant PC attributes and the relative importance of these attributes. The second part focuses on the benefit segments within the sampled population.

### Importance of the PC Attributes

Preliminary research using focus groups identified five attributes and the associated levels of these attributes that influenced the PC choice. As noted earlier, these five attributes were (1) screen size, (2) price, (3) memory, (4) HDD storage, and (5) the processor. The results of the conjoint analysis are shown in Table 3.

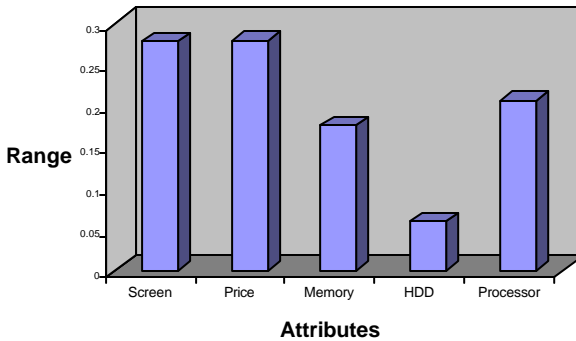
**TABLE 3: Average Utility Value for Each Attribute**

Attribute	Level	Description	Average Utility
Screen size	1	13 inches	0.149
	2	15 inches	3.497
	3	17 inches	1.494
Price	1	\$1000	3.607
	2	\$1500	0.234
	3	\$2000	1.416
Memory	1	64 Megabytes	0.103
	2	128 Megabytes	2.220
HDD	1	8 Gigabytes	0.167
	2	10 Gigabytes	0.882
Processor	1	Pentium II	0.205
	2	Pentium III	2.688

As shown in Table 3, when the five attributes are viewed collectively, price is the most important with the highest average utility value of 3.607 associated with a price of \$1,000. Screen size is the second most important attribute with a slightly lower average utility value of 3.497 associated with a 15-inch screen. The processor used in the PC is the third most important attribute with an average utility value of 2.688

associated with the Pentium 3 processor. This is followed by memory capacity with an average utility value of 2.220 associated with 128-megabytes. The least important of the five attributes is the HDD capacity with an average utility value of 0.882 associated with a 10-gigabyte capacity. These findings are summarized in Figure 2. Because all utility scales in conjoint analysis are expressed in a common measurement unit, we can compare utility values from one attribute to another to obtain an indication of the relative importance of the five attributes. Nevertheless, it should be noted that the relative importance of an attribute is influenced by the levels of that attribute that are included in the design. Therefore, incorporating the "right" levels of an attribute is important to the validity of the results.

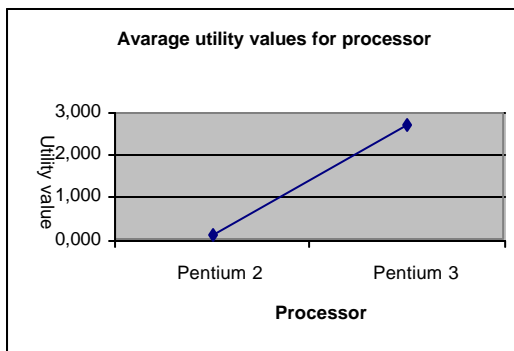
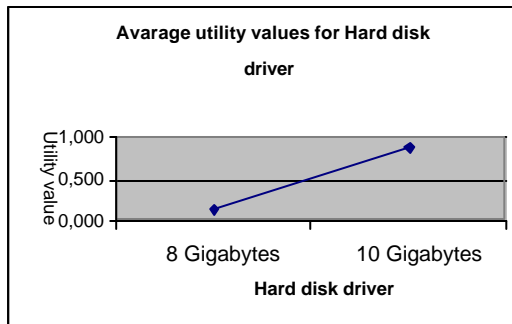
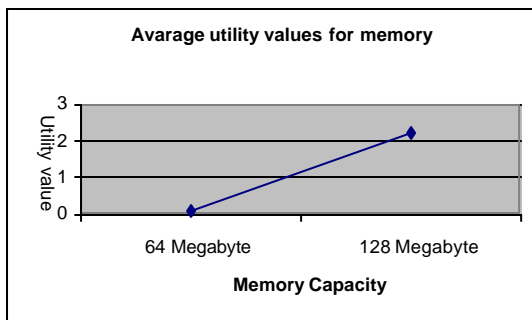
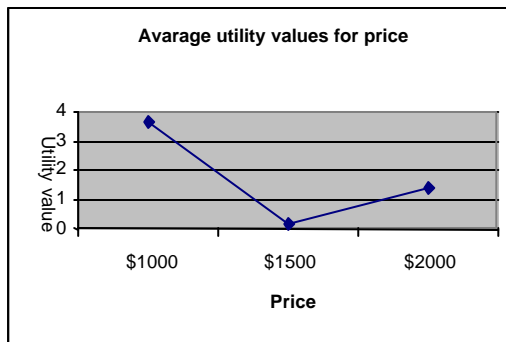
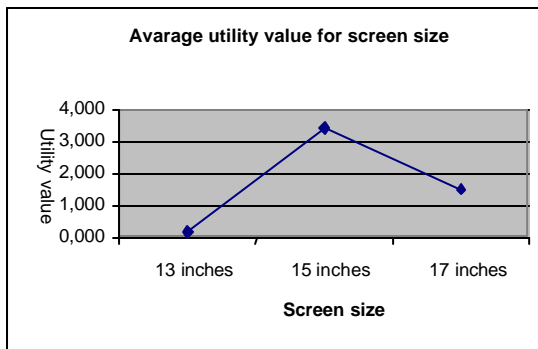
FIGURE 2: Relative Importance of Factors



When attention is focused on each of the five attributes individually as shown in Figure 3, it can be seen that for the attribute, screen size, the 15-inch screen has the highest utility of the three screen sizes. It is interesting to note that the utility of a 15-inch screen is higher than that of a 17-inch screen. This may appear counter-intuitive if the implicit price to screen size trade-off is not considered. Among the three price levels, a price of \$1,000 has the highest utility. As in the case of screen size, once again it is interesting to note that the \$2,000 price has a higher utility than the lower price of \$1,500. For the attribute, memory, expressed at two levels, the higher PC memory of 128 megabytes has a higher utility.



FIGURE 3: Average Utilities for All Attributes



For the HDD attribute at two levels, the 10-gigabyte level has the higher utility. Finally, for the fifth attribute, the processor, the Pentium 3 processor has a higher utility than the Pentium 2 processor.

**Market Segments**

The sheer volume of research literature devoted to market segmentation makes it easy to lose sight of its basic tenets. Therefore, presenting a brief summary of these tenets would be useful:

- ✍ Consumers are different in terms of their buying preferences and purchases for goods and services.
- ✍ The differences in consumer preferences and purchases are influenced by a multiplicity of demographic, psychographic, product usage, occasion of purchase, and other factors.
- ✍ Consumer satisfaction and company profitability can be improved by recognizing these differences in consumer preferences and modifying products/services or creating new products/services to accommodate these differences among consumers.

To identify the market segments, in this study, Quick Cluster, an SPSS statistical clustering program, was used for clustering the 81 participating students into clusters on the basis of the similarities in their preferences for the five product attributes and their related levels. The minimum squared Euclidean distance criteria between all clustering variables were used to form the clusters. Table 4 summarizes the results of the cluster analysis.

**TABLE 4: Cluster Profile for the Three-Cluster Solution**

Variable Number	Attributes	Clusters		
		I	II	III
V1	Screen size 13 in.	0.344	.092	0.000
V2	Screen size 15in.	1.614	2.934	6.318
V3	Screen size 17 in.	0.816	1.133	2,708
V4	Price \$1000	2.769	6.039	1.511
V5	Price \$1500	0.337	0.000	0.410
V6	Price \$2000	0.991	2.457	0.593
V7	Memory 64 mb	0.146	0.058	0.110
V8	Memory 128 mb	2.350	1.994	2.357
V9	HDD 8 gb	0.319	0.035	0.161
V10	HDD 10 gb	1.046	1.082	0.447

V11	Processor Pen. II	0.160	0.287	0.154
V12	Processor Pen. III	4.526	1.949	1.545

As shown in Table 4, three clusters were identified. Cluster 1 has relatively high values on variable 4 (price--\$1,000), variable 8 (memory--128 megabytes), and variable 12 (processor--Pentium III). Of these three variables, variable 12, (processor--Pentium III) has the highest value of 4.526. The benefit associated with this variable is computing speed. Therefore, this cluster places a premium on computing speed and may be labeled the "speed" segment. This cluster consists of 27 college students or 33 percent of the sample of 81 college students. Of these 27 students 67 percent are female.

Cluster 2 exhibits relatively high values on variable 2 (screen size — 15 inches), variable 4 (price--\$1,000), and variable 6 (price--\$2,000). Of these, the highest value of 6.039 relates to variable 4 (price--\$1,000). Interestingly, the third highest value of 2.457 is on variable 6 (price --\$2,000). Thus, it appears that this cluster is price conscious and, therefore, may be labeled the "price conscious" segment. This cluster consists of 30 students, which makes it the largest of the three clusters at 37 percent. In contrast to cluster I, the number of females in this cluster is significantly lower at 23 percent.

Cluster III exhibits high values on variable 2 (screen size --15 inches), variable 3 (screen size --17 inches), and variable 8 (memory--128 megabytes). Of these three variables, a screen size of 15 inches has the largest value at 6.318. The second largest value of 2.708 is for a screen size of 17 inches. Thus, it appears that screen size is the most important attribute for this cluster. The major benefit of a larger screen size is better visual clarity and more appealing graphics. Thus, it appears that this segment is more graphics or visually oriented. With 24 students in this cluster, it is the smallest, accounting for approximately 30 percent of the sample. In terms of gender composition, 67 percent of this cluster is comprised of females.

A one way analysis of variance and the univariate F test were used to identify the variables that were significant in differentiating among the three clusters. Table 5 presents the results of this analysis.

**TABLE 5: ANOVA Table**

Variable Number	Attribute	Cluster mean square	df	Error mean square	Df	F	Sig.
V1	Screen size 13 inch	0.827	2	0.407	78	2.032	Ns
V2	Screen size 15 inch	148.122	2	1.541	78	96.114	0.000
V3	Screen size 17 inch	25.854	2	0.930	78	27.814	0.000
V4	Price \$1000	150.929	2	1.726	78	87.446	0.000
V5	Price \$1500	1.337	2	0.432	78	3.092	Ns
V6	Price \$2000	26.807	2	0.872	78	30.753	0.000
V7	Memory 64 mb	0.055	2	0.033	78	1.679	Ns
V8	Memory 128 mb	1.222	2	1.976	78	0.619	Ns
V9	HDD 8 gb	0.570	2	0.186	78	3.074	Ns
V10	HDD 10 gb	3.239	2	1.039	78	3.117	Ns
V11	Processor Pen. II	0.158	2	0.201	78	.787	Ns
V12	Processor Pen. III	69.479	2	1.114	78	62.383	0.000

As can be seen in Table 5, of the twelve variables, five are significant in discriminating among the three clusters at the 0.05 level of significance. These are (1) Variable 2, the screen size of 15 inches, (2) Variable 3, the screen size of 17 inches, (3) Variable 4, the price of \$1,000, (4) Variable 6, the price of \$2,000, and (5) Variable 12, the Pentium III processor.

## Discussion

Increasing customer satisfaction oftentimes involves positioning a product appropriately so as to enhance its appeal to the targeted market segment. As illustrated here, conjoint analysis can be used to identify

the relative importance of product attributes and their levels to PC buyers. This information can be used for creating, modifying, and positioning PCs by incorporating attributes that influence purchase choice. In effect, conjoint analysis can be used to increase the purchase appeal of PCs. For example, the conjoint analysis in this study suggests that when each of the five PC attributes is looked at individually, a screen size of 15 inches has the highest utility among the three screen sizes. For the attribute, price, a price of \$1,000 has the highest utility. For the attribute, memory, a memory of 128 megabytes has the highest utility. For the attribute, processor, the Pentium III processor has the highest utility. When all of the attributes are viewed collectively in terms of the importance of each attribute in relation to the others, price emerges as the most important. Screen size is the second most important, and the processor comes next. Memory is fourth in importance, and the HDD is a distant fifth. To the PC marketer, these results provide insights concerning which attributes to focus on when developing, positioning, and marketing PCs.

The cluster analysis used here, a post-hoc segmentation approach, utilized the utility functions of the participants (developed through conjoint analysis) for the five attributes decided upon and their associated levels to form three clusters. The attribute utility scores of each individual in the conjoint analysis were used to group the individuals participating in the study into the clusters. Within a cluster the average similarity is high and between clusters similarity is low. Thus, individuals in each of the three clusters identified in this study have similar preferences in terms of the levels of the five PC attributes. However, the attribute level preferences of the individuals belonging to different clusters are dissimilar. The three clusters represent benefit based market segments, in that the preferred attribute levels relate to the benefits that flow from these attributes. The dominant benefit sought by cluster I is speed, and, to a lesser extent, low price. The dominant benefit sought by cluster II is clearly low price. The dominant attribute sought by cluster III is screen size, with a strong preference for a 15-inch screen followed by a 17-inch screen. The preference for larger screen size may relate to the benefit of better graphics and visual appeal.

Given that this study was conducted with a sample of 81 students from a university in Turkey, the findings may not be projectable to a larger population of computer buyers. Generalizing the findings of this study to a larger population was not the intent of this study. Rather, the

focus of this research was to demonstrate the application of the statistical techniques of conjoint and cluster analysis to product positioning and market segmentation, in the context of PCs. Any generalizations to other populations of PC buyers obviously must be made with caution.

The conjoint analysis output (i.e. the utility functions of the individual participants for the attributes and related levels) was the input to the cluster analysis. Given this, the limitations of conjoint analysis will condition the findings of the cluster analysis. A limitation of conjoint analysis worth keeping in mind is that conjoint analysis is basically predicated on a static model. That is, the preferences of consumers for certain product attributes and the related levels relate to a specific point in time. As new attributes or attribute levels related to a product category come into play over time, consumer preferences and the related utility functions may shift or change. This kind of change would correspondingly change the benefit based consumer segments.

The use of conjoint and cluster analysis could be used in the area of tourism. For example, tourism packages could be designed in terms of the attributes or benefits that appeal to various foreign tourist segments visiting Turkey. Similarly, the foreign tourist market could be segmented into benefit segments identified in terms of the key benefits sought, using conjoint and cluster analysis in tandem. The application of these techniques to tourism is promising and yet largely unexplored.

However, conjoint analysis studies need to be undertaken with care. For example, it is possible that important product attributes or relevant levels of these attributes may be overlooked and thereby not included in the model. Moreover, including too many attributes with too many levels is inadvisable given the likelihood of participant fatigue and reliability and validity problems. The use of well conducted focus groups to identify the relevant attributes that influence buyer choice is desirable. In addition, when research of this nature is conducted, collaboration between the researcher and the product manager or client is advisable in order to guide product development and/or positioning decisions.

As with conjoint analysis, cluster analysis has limitations, too. Care must be exercised in interpreting the clusters. For example, how does one interpret clusters in which no one or two attribute variables are

clearly dominant in terms of utility values? Using this study as an example, clusters II and III had dominating values on the variable, price, the price of \$1,000 and the variable, screen size, the screen size of 15 inches, respectively, making these two clusters easier than cluster I to interpret and name.

Despite these limitations of conjoint analysis and cluster analysis in the context of product positioning and benefit segmentation, these techniques, when properly used, can be very useful in improving product positioning and market segmentation strategies. Furthermore, the availability of inexpensive and easy to use software packages to carry out both conjoint and cluster analysis enhances the appeal and the ability to use these types of analysis when trying to improve product design, positioning, market segmentation, and target marketing decision-making.

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