The Characteristics Theory and Computers:
How Much Are They Really Worth?

ACE 270
Consumer Economics Project
April 29, 2000
Michael Kinate
Brea Nelson
Background Information

Thinking back a few years to the early 1980s, it would be difficult for one to talk about the ‘technological revolution’ or the ‘computer age.’ In the past fifteen years, however, due to rapidly expanding technology and shrinking manufacturing costs, the computer market has exploded, and both the ‘technological revolution’ and the ‘computer age’ are upon us. The number of brands, processors, hard drives, and other amenities seem to be innumerable, and as a consumer, it can be difficult to know which one to choose. Along with the large number of computer brands available in stores around the world, people now have the option to purchase a computer from a traditional computer store, such as Best Buy or Staples, or an online, custom-made computer company, such as Dell or Gateway. The main brands that this project studied include Compaq, Hewlett Packard, Dell, and Gateway. Before further investigating the differences in the prices and attributes, we will take a closer look at the manufacturers studied to have a better understanding of the personal computer market.

Compaq is a company based out of Houston, Texas, and they have been incorporated since December 1982. In the past eighteen years, they have grown tremendously, and their stock price has also increased. The initial public offering for their stock in 1983 raised the sixty-six million dollars necessary to get the company off the ground, and the price has increased from $11 per share to $29 per share since then. Their ranking of number twenty in the Fortune 500 ranks them as one of the world’s most successful companies (Fortune 500 Website).

Much like Compaq, Hewlett Packard has deep roots in the computing industry. Incorporated in 1947, Hewlett Packard actually came into existence in the 1930s. However, it
was not until 1980 that they introduced their first personal computer, the HP-35 (Hewlett Packard Website). Ranked thirteenth in the Fortune 500 index, the company’s stock price continues to steadily increase, as it is now valued at $135 (Fortune 500 Website, NYSE Website). Customers that purchase operating systems from Compaq and Hewlett Packard do so for a variety of reasons. First and foremost, they generally seem to be less expensive than their counterparts and they are also more convenient from a consumer’s standpoint. Generally, to purchase a Compaq or Hewlett Packard, a customer simply has to stop in at the closest office supply store and choose the computer that fits his or her immediate computing needs.

In contrast to Compaq and HP, Gateway and Dell lie on the opposite end of the PC spectrum. These two companies have come about within the past ten to fifteen years, and they allow computer purchasers to buy computers over the phone or the internet—thus they are often referred to as ‘mail order’ computer companies. Both of these companies have gone public, as Gateway’s Initial Public Offering (IPO) was on December 8, 1993 and Dell’s IPO was on June 22, 1988. Dell opened at $9.75 and Gateway at $5.19. Both of these companies have experienced growth in their stock values, as Dell closed at $50.13 and Gateway 2000 at $55.31 (Dell Website, Gateway 2000 Website). Dell and Gateway 2000 are both listed in the Fortune 500, Dell at 56 and Gateway 2000 at 203 (Fortune 500 Website).

People that order from Gateway or Dell do so for several reasons. Both Gateway 2000 and Dell strive for achievement in customer service and quality components. Since the companies advertise that more than they advertise their prices, it is possible that many people are moving toward purchasing from companies that will tailor to their needs. The other group that Dell and Gateway target are the customers with slightly more in-depth computer knowledge, as both companies allow and encourage customers to customize their systems.
All of the above-mentioned background information is important to consumers for numerous reasons. First and foremost, the relatively consistent increases in the stock prices indicate that the companies are all growing and maintaining or increasing their profitability. The Fortune 500 rankings also indicate a company’s profits. For a consumer interested in purchasing a computing system, a company’s profit may not seem very important. However, it is important to realize that the continuing profits and longevity provide reassurance to customers that the company will be able to continue to serve them.

Further, the Fortune 500 Rankings are indicative of consumer’s tendencies regarding computer system purchases. Though all four companies are obviously strong, Compaq and Hewlett Packard clearly have higher revenues than Dell and Gateway. This illustrates that, though the ‘mail order’ computer companies are increasing in size and sales, consumers still have a greater tendency to purchase the more convenient (and often less expensive) Compaq and Hewlett Packard computers. Compaq and Hewlett Packard’s ability to capitalize on people’s desire to save money allows them to continue growing.

Data Analysis

The Characteristics Theory assumes that consumers buy goods based on the attributes or characteristics of the good. Classical economic theories assumed that in competitive markets, firms would produce goods that were exactly the same. In reality, however, most goods differ slightly from their competitors. The substitute products differ on the quantity and availability of certain product features. Some products have simple low-cost components while others feature expensive, high quality options. The Characteristics Theory can be applied to the personal computer market, since both computer manufacturers and the different models that they produce vary widely in their design and features.
In order to keep things simple for our project, we decided to focus on two important computer components: processor speed, measured in megahertz, and RAM (Random Access Memory) capability, measured in megabytes. Computers have hundreds of varying components, but the biggest differences can be found in the computer’s processor speed and its RAM space. We collected data from two differing sources. First, we searched for information for Dell and Gateway computers on their individual websites, since these companies allow customers to customize and order their PCs over the phone or computer. Then we collected data for Compaq and Hewlett Packard computers at Staples in Champaign. The prices that Staples charges should be a reasonable reflection of the fair market value for these PCs.

Initially, we looked up the processor speed, size of the RAM component, hard drive capacity, and price. After collecting the data, we realized that hard drive space can be reduced or increased inexpensively, so we decided not to analyze the hard drive data. Also, we noticed that the computers had a wide range of processor speeds and prices. Since computer manufacturers charge higher prices for faster computers, we decided to break up our data set into three groups, based on the processor speed. Next, we set up an Excel spreadsheet and calculated the processor speed and RAM that consumers buy per dollar. We then graphed our results to see which computers actually maximize consumer preferences of processor speed and RAM. If the graph has a convex shape, the consumer will be equally likely to buy any of the computer models. They will choose the computer that maximizes their preferences for computer speed and RAM capability. However, if the graph is concave, some of the computer models are inefficient compared to similar models. The consumer should pick the models at the endpoints of these graphs, since they maximize either processor speed or RAM. Based on the competitive nature of the personal computer market, we hypothesize that the resulting graphs would be convex graphs.
Thus the consumer could choose any of the models based upon the characteristics that they are interested in. However, all three groups produced concave graphs, so consumers are forced to choose some models over the rest of the field, as some models are far less efficient choices.

Group I consisted of computers from Dell, Gateway, and Hewlett Packard, and each computer had a 433 or 500 MHz Intel processor chip. These computers were the slowest of all the models in the project, so their prices were less expensive than the other models for the most part. After graphing the data points for the five models, the resulting curve was concave. Thus, consumers should purchase computers B and E. Computer B, a Gateway Essential 433c model, maximizes RAM per dollar. This particular Gateway model features 128 MB of RAM, the only one of the five models to do so. Computer E, the Hewlett Packard Pavilion, maximizes processor speed per dollar spent. Hewlett Packard offers the Pavilion model with a 500 MHz chip at a price $200.00 cheaper than the nearest substitute. Because the Dell Dimension and the other Gateway and HP models do not combine an efficient mixture of speed and RAM, consumers should avoid these computers and spend their income more efficiently on the “endpoint” models.

The reasons why these two models are the best buys in Group I become evident after analyzing Gateway’s and Hewlett Packard’s marketing strategies. Gateway has become successful by allowing customers the capability of upgrading their computers. The Gateway Essential 433c was the only model of the group to offer 128 megabytes of RAM. Customers want to buy a computer that is tailored to their preferences, which is why Gateway has become successful. They realized the need for tailored computers, and they can charge higher prices for these customized units. Hewlett Packard has jumped back into the PC market by seeing the need for low-cost computers. The HP Pavilion was the least expensive of all the models, and it was
still capable of producing speed and memory comparable to the Dell and Gateway models, but at a much lower price.

Group II combines PCs from Compaq, Gateway, and Hewlett Packard. All of the computers have either 533 or 550 megahertz Intel processing chips. Again, when we graphed the megahertz per dollar and the megabytes per dollar, the graph produced a concave curve. Consumers should again pick the endpoint models, since they maximize either processor speed or RAM. The Compaq Presario 7470 maximizes processor speed, since it has a powerful 533 MHz processor chip. Its low price (approximately $300 below its competitors) gives a consumer a very fast computer for a relatively small amount of money. If a consumer prefers more RAM per dollar, then they should choose the HP Pavilion model. Although it has the highest price, its 128 megabytes of RAM distances it from its competitors. The Gateway Essential models fail to give the consumer an efficient mixture of megahertz and megabytes, so they should be avoided based on the data collected.

A closer look at the philosophies of Compaq and Hewlett Packard will explain their recent successes in the personal computer market. Compaq is looking to regain market share by offering quality computers with lots of power at a relatively low price to consumers. Compaq has deleted a lot of the unnecessary features that only add more costs to the computer and are features that many consumers do not want to spend money on anyway. The Compaq studied in this project was over $300.00 cheaper than its rivals, but offered the same amounts of megahertz and megabytes. Hewlett Packard has learned a lesson from its successful competitors Dell and Gateway. The HP Pavilion computer analyzed in this project was the only one with 128 MB of RAM. The company doubled the RAM capability for a price increase of only $150.00. By
differentiating its products from its competitors, Hewlett Packard looks to regain a foothold in the competitive PC marketplace.

Finally, Group III features the personal computers with the fastest Intel processors. Out of the three models investigated, the two Dell Dimension L computers came out on top. One model maximizes speed, while the other model maximizes RAM capability. The Dell Dimension L600r with the 600 MHz chip and a price of only $1,089.00 maximizes processor speed for each dollar spent. The other Dell Dimension L600r has a 128 MB of RAM at only $90.00 more. The large increase in RAM makes it the best choice for computer shoppers who like lots of memory capability. The Compaq 510 model is nearly $400.00 more expensive than the two Dell models and only offers a processor with 50 more megahertz. Consumers should avoid the Compaq model since it does not efficiently combine megahertz and megabytes.

The result of seeing Dell computers being the best buys in the last group should come as no surprise. Dell has become a personal computer market leader by offering high-quality computers with lots of power and features for a relatively affordable price. Dell continues to lead the way by offering computers with 600 MHz processors at the same prices that Gateway and Staples demand for 533 and 550 MHz computers. Combining low prices with Dell’s superior customer service, computer customization capabilities, and affordable payment plans, it is easy to see why Dell became the most profitable computer manufacturer during the 1990s.

**Conclusion**

Upon studying the data collected and analyzing the results of our findings, several things became apparent. First and foremost, the personal computer market is clearly an excellent example of the Characteristics Theory. Not only does it allow consumers to utilize their personal preferences in regards to purchasing certain components, but it also illustrates that often times
consumers make inefficient choices and do not realize it. We were also able to see that there is not one particular company who dominates the market as the most efficient consumer choice.

There were several interesting side notes that we noticed in doing our research. However, it was difficult to put them in a particular place in our data analysis. In doing research regarding Dell Computers, we came across an example of price discrimination. When customizing a personal computer on the Dell website, there are two different places that a consumer can adjust the processor speed. If the customer chooses to make the change in the first area, it increases the price of the computer by $119.00. However, if one were to wait until the second area to change the processor speed, it only costs $20.00. We believe that this is an example of price discrimination, as the inframarginal customer would generally choose the first area to increase the processor speed. However, the marginal customer would tend to delay the processor speed increase. By offering two different areas to increase the processor speed, Dell is seizing all of the available producer surplus from their customers.

The other fact that we found interesting is that, in most cases, Gateway 2000 Computers and Dell computers seemed to be inefficient choices. However, we believe that they are an efficient choice if a consumer is looking for the highest quality components and service. Components, such as better speakers and higher CD-ROM speeds are standard on Gateway 2000 and Dell systems, whereas these components would simply increase the price of a Compaq or Hewlett Packard.

In conclusion, this project brought some interesting economic points to light. Prior to conducting our research, we felt that we would see mostly convex curves regarding the Characteristics graphs due to the highly competitive personal computer market. However, we were surprised to find that this was not the case. This could be due to several things, including
possible information problems, but we believe that it can also be attributed to the small number of characteristics that we studied. Overall, the research that we conducted disproved our hypothesis regarding the convex shape of the characteristics graphs, as all of the graphs were concave. On the other hand, our data showed that Gateway 2000 and Dell were inefficient choices, which we believed would be the case, as the quality of the components and the service provided were not characteristics taken into consideration. If we had the means to study more characteristics, we hypothesize that Gateway 2000 and Dell personal computers would be much more competitive, and in some cases, the obviously efficient choice.
Works Cited


<table>
<thead>
<tr>
<th>ID</th>
<th>Brand and Model</th>
<th>Speed (MHz)</th>
<th>RAM (MB)</th>
<th>Hard Drive (GB)</th>
<th>Price</th>
<th>MHz/$</th>
<th>MB/$</th>
<th>GB/$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Dell Dimension L500cx</td>
<td>500</td>
<td>64</td>
<td>10</td>
<td>$929.00</td>
<td>0.538</td>
<td>0.069</td>
<td>0.011</td>
</tr>
<tr>
<td>B</td>
<td>Gateway Essential 433c</td>
<td>433</td>
<td>128</td>
<td>10</td>
<td>$989.00</td>
<td>0.438</td>
<td>0.129</td>
<td>0.010</td>
</tr>
<tr>
<td>C</td>
<td>Gateway Essential 433c</td>
<td>433</td>
<td>64</td>
<td>10</td>
<td>$899.00</td>
<td>0.482</td>
<td>0.071</td>
<td>0.011</td>
</tr>
<tr>
<td>D</td>
<td>Hewlett Packard 6640C</td>
<td>500</td>
<td>64</td>
<td>15</td>
<td>$799.98</td>
<td>0.625</td>
<td>0.080</td>
<td>0.019</td>
</tr>
<tr>
<td>E</td>
<td>Hewlett Packard Pavilion</td>
<td>500</td>
<td>64</td>
<td>10.2</td>
<td>$599.98</td>
<td>0.833</td>
<td>0.107</td>
<td>0.017</td>
</tr>
<tr>
<td>F</td>
<td>Compaq Presario 7470</td>
<td>533</td>
<td>64</td>
<td>20</td>
<td>$799.98</td>
<td>0.666</td>
<td>0.080</td>
<td>0.025</td>
</tr>
<tr>
<td>G</td>
<td>Gateway Essential 550</td>
<td>550</td>
<td>64</td>
<td>10</td>
<td>$1,109.00</td>
<td>0.496</td>
<td>0.058</td>
<td>0.009</td>
</tr>
<tr>
<td>H</td>
<td>Gateway Essential 550</td>
<td>550</td>
<td>64</td>
<td>20</td>
<td>$1,149.00</td>
<td>0.479</td>
<td>0.056</td>
<td>0.017</td>
</tr>
<tr>
<td>I</td>
<td>Hewlett Packard Pavilion</td>
<td>533</td>
<td>128</td>
<td>20.4</td>
<td>$1,299.98</td>
<td>0.410</td>
<td>0.098</td>
<td>0.016</td>
</tr>
<tr>
<td>J</td>
<td>Compaq 510</td>
<td>650</td>
<td>128</td>
<td>10</td>
<td>$1,549.00</td>
<td>0.420</td>
<td>0.083</td>
<td>0.006</td>
</tr>
<tr>
<td>K</td>
<td>Dell Dimension L600r</td>
<td>600</td>
<td>128</td>
<td>10</td>
<td>$1,179.00</td>
<td>0.509</td>
<td>0.109</td>
<td>0.008</td>
</tr>
<tr>
<td>L</td>
<td>Dell Dimension L600r</td>
<td>600</td>
<td>64</td>
<td>10</td>
<td>$1,089.00</td>
<td>0.551</td>
<td>0.059</td>
<td>0.009</td>
</tr>
</tbody>
</table>