

SEARCH ENGINE UTILIZATION ANALYSIS  
EXPLORING LINKS BETWEEN PERSONALITY TRAITS AND INTERNET SEARCH  
BEHAVIOR

By  
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## Abstract

In order to examine the correlation between personality traits and Internet search behavior, a sample of 28 college students from the University of Arizona was collected. The students first completed a five-minute search task to find a digital camera meeting a list of specifications that they felt was “best.” The subject’s search path was recorded on screen-capture software to be analyzed at a later date. The respondent then took a 60-question survey regarding the task and personality traits.

Each hypothesis was plotted as a linear regression, with the exception of yes/no variables, which were subjected to a two-sample t-test. Upon analyzing the results, a negative correlation between perfectionism and perceived ease of site navigation was found. Positive correlations were seen between perfectionism and need for cognition with number of sites visited, and between need for cognition and total clicks. A surprising positive correlation was found between perfectionism and recommendation satisfaction. A significant difference was also found in cautious respondents’ use of sponsored links.

By analyzing the statistical evidence of the task, the survey suggests possible causes for the relationships and implications for marketers with Internet retailers. The researcher offers marketing strategies that consider a personality-based segmentation of the market.

## Introduction

Information search is an integral step in consumer decision behavior, and consumers search online for information in many buying decisions. Various personality traits may have an impact on the search process and the consumer’s opinion of the search, while others may lay dormant and have little effect on the situation.

This research examines the links between five specific personality traits and the consumer’s search pathway toward an Internet purchase. For example, the ties between the facets of perfectionism and number of clicks or cautiousness and sponsored link usage may provide insight about patterns in purchasing, search, and Internet usage. New knowledge about these connections can help marketers glean valuable information about their clients’ habits and the best ways to reach their intended markets.

Strong correlation between the personality trait and specific Internet search behaviors might indicate a predictive relationship between traits and the behavior. If this holds true, personality categorization of consumers can open a new gateway for online marketers. The links between traits and patterns in searching would be useful in matching marketing segments with different methods of advertisement and promotion a company should use. For example, if a company’s customer base had a large segment of perfectionists, according to the hypotheses, they would visit many sites. With this knowledge in hand, the marketers may decide not to spend much money on linking the site to others, because their customers are willing to click more than the first link on the search page.

## Purpose of Study

This study aims to explore links between personality traits and Internet search behavior. Various personality traits may impact consumers' search process through web pages, which could be useful for marketers and entrepreneurs in devising their advertising strategies. The search task was designed to track and record the Internet search path using a digital camera with given requirements.

Potentially relevant personality traits were selected from various inventories that were originally developed to measure personality, and they have been adapted for the purposes of this study. By analyzing these traits in conjunction with the search behavior, it may be possible to segment customers and match them with behavioral patterns. While an exploratory study of this nature cannot serve as a predictor of actions, it may help marketers promote their sites more effectively for their customer segments.

## Literature Review

### Information Search

Two types of information search, internal and external, occur during prepurchase and ongoing searches. Internal search from memory and experience varies on extent, type of information, and search biases. External search from various sources can vary on extent, place of occurrence, type of information, and method of searching (Hoyer and Macinnis). External search will be the focus of this research.

Marketers are exceptionally interested in the information search process because consumers only recall a small subset of information, so knowing the variables of the search process can be vitally important. When analyzing different mediums, such as search engine marketing, a company wants to know the traits, methods, and attitudes of its users so that it can ensure strong returns from the budget (Hoyer and Macinnis).

### Search engines

In general, Internet search is measured by a number of metrics to keep a company's pricing in-line and to better target customers. Some of the most readily measurable and applicable metrics are click-through rate, visitor path, and cart abandonment rate (Hoyer and Macinnis). Click-through rate is extremely important for businesses like Google AdWords in analyzing return on investment (ROI) for companies purchasing words or phrases. If ROI for the purchasing company is too high for a phrase, Google may increase its price to make a heartier profit from the successful ad campaign. Visitor path shows the most likely routes through a web page, giving designers an idea of how to prioritize the pages within the site, and helping marketers choose the entry point to advertise for maximum efficiency. Cart abandonment rate, or the number of customers who leave a site after placing item(s) in their virtual shopping bag, can point out an inefficient purchasing process or badly designed website.

## Search Engine Marketing

Arguably the most famous search engine marketing (SEM) program is Google AdWords, an extension of the search site that allows companies to set spending limits based on pay-per-click advertising. Businesses can choose a number of clicks or a total spending cap to accurately define costs and minimize budget overages. The small per-click fees make it possible for smaller companies to enter the market as contenders, and are a viable method of advertising for low-budget marketing operations.

SEM can include a single word or string of text, and the system displays an ad when those words are searched (Nymark and Ramazan). To top the list of sponsored links, businesses must pay the highest price for the word or phrase or be the most often searched or linked site. For new or small sites, it can be difficult to drive traffic in, making AdWords an attractive way to put sites on the radar. Typical web crawlers first list results that are frequently tied to other pages, and are often referenced elsewhere, assuming they are credible sources. Sponsorship requires no ties or popularity, but will list the site in its highlighted box for a small fee.

One of the major problems with SEM is the disconnect between marketers and consumers. Studies show that 33% of search engine users are shopping for something and 41% of those shoppers employ a search engine to find a site when considering a purchase (Nymark and Ramazan). However, users seem to distrust sponsored links, which may make AdWords and other search engine marketing programs futile in the future (Jansen and Resnick).

## Natural vs. Paid Search Results

Most SEM (search engine marketing) companies offer paid listings that appear atop results pages in separate boxes, often labeled "Recommended Sites" or "Sponsored Links." According to Jansen & Resnick, there is a "potential disconnect between the perception of sponsored listings by business and users." Often, users find sponsored links less relevant or downright suspicious, and are less likely to click them. Conversely, businesses see sponsored links and paid results to be the future of Internet marketing. According to a 2006 survey, over 77% of consumers favored organic links over sponsored links (Jansen and Resnick).

## Online shopping market

Internet purchases are becoming much more popular, especially with the Millennial generation (those born between 1982 and 2000). Jupiter Research found that 15% of spending by Millennials is on the Internet. In addition, 49% of teenagers use the Internet to research a purchase before buying it from a brick and mortar store (Internet Retailer Staff).

Consumers who shop online cannot touch or handle products. The information provided on a website is the only assistance provided for analyzing a product, and is the main factor in decision-making (Park). Each site has limited information, but the Internet as a whole has a vast selection of products, along with features that enable screening and comparison (Alba, Lynch and Weitz). Without the Internet to browse products, consumers could take a hands-on approach to comparing items, but would probably not compare so many items or analyze as many features.

## Psychological impact on shopping behavior

Consumer characteristics are the first qualifier for user acceptance of online shopping. While site design and product type impact the likelihood of someone shopping online, the personality traits of the user play a role in their usage of the Internet (Lian and Lin). Individual personality differences influence the way that people use the Internet, and can be exceptionally valuable to marketers. By knowing the traits that correspond to different paths or patterns in online shopping, advertisers can spend money in the proper places to make the most impact with their customer base.

## Personality tests

Opinions of validity of personality inventories vary widely. Some researchers side with specific theories and tests, while others believe that no test is credible. The Big Five is one of the most common personality tests, but critics believe that it focuses too much on traits and not enough on the individual and that it is descriptive rather than explanatory. Some say that the test format is invalid because it biases the respondent to put the socially acceptable answer and that self-esteem may alter the respondent's opinions. On the other hand, proponents of the theory advocate that it provides an abstract foundation for analysis. The traits are often seen as the top level of a hierarchy and that they might not be useful for making concrete conclusions, but can foster discussion and direct analysis (Pervin and John).

The International Personality Item Pool (IPIP) began in 1992 and was funded by the U.S. National Institute of Mental Health; their goal was to make personality inventories more available to the public and to speed the research process. Some forms provide a public alternative to other tests while others measure completely original constructs. A critique of the IPIP site is that it does not contain general-purpose validity indices (Goldberg, Johnson and Eber), but the site does offer tips for creating one's own validity checks. The site expresses permission to alter scales for personal use, and recommends adapting the forms. For the sake of this experiment, a few items were omitted from the long forms to minimize redundancy and keep the survey manageably short for respondents. The majority of the personality traits examined in this experiment come from the AB5C Facets on IPIP.

An additional personality construct is Need for Cognition, penned by Cacioppo and Petty in 1982 and found in the Handbook of Marketing Scales. The scale has been tested, and scores internal consistency reliability of .91 on the short form. The form's development section explains that the order of questions is often varied to inhibit response bias (Cacioppo and Petty).

## Measurements of Behavior

While the survey contains the personality trait information and satisfaction questions, many of the observed traits come from the search task. These behaviors and their measures are defined below.

### Total clicks

This factor is the total number of links and pages explored. This does not include clicks on links such as “top of page” that do not change the URL. It does include filters used within a page, because it may change the contents of the page.

### Number of sites

This factor is the number of differing base pages visited. Different pages within the site are not counted. For example, [www.arizona.edu/home](http://www.arizona.edu/home) and [www.arizona.edu/academics](http://www.arizona.edu/academics) would not be considered different base pages and would be grouped within one site. On the other hand, [www.arizona.edu](http://www.arizona.edu) is separate from [www.asu.edu](http://www.asu.edu). A site is only counted once if it is revisited with the “back” button of the browser, but may be counted as multiple sites if the participant reaches the site through a different query or path.

### Site penetration

This metric analyzes the number of pages within one site that are visited. The deepest site visit is recorded as the penetration. For example, if one went to [www.arizona.edu/home](http://www.arizona.edu/home) and [www.arizona.edu/academics](http://www.arizona.edu/academics), that would be penetrating two pages into the site.

### Use of sponsored links

This metric is a yes/no metric that marks whether or not the participant clicks on at least one sponsored link on the Google search page.

### Time utilized

While five minutes are given for the task, the participant may choose to finish the task early. This measure is a yes/no qualifier for whether the person finished within five minutes or not.

## Trait definition

These personality traits were chosen based on a logical and intuitive possible connection to search behaviors.

### Assertiveness

These respondents need little time to make a decision, and quickly choose a path and stick to it. As defined by the American Heritage Dictionary, assertiveness is an adjective meaning “inclined to bold or confident assertion; aggressively self-assured” (Assertiveness). In the context of this survey, respondents who are identified as assertive are confident and directed. As a consumer, assertiveness means expressing opinions and preferences and speaking up for what one wants (Wehmeyer).

### Understanding

According to the American Heritage Dictionary, understanding is an adjective meaning “compassionate; sympathetic” (Understanding). Respondents who are identified as understanding are considered empathetic and are often concerned about others’ problems, needs, and viewpoints. These respondents have an interest and concern for the actions and

feelings of others, and think beyond themselves (Goldberg, Johnson and Eber). They seek the opinions of others.

### **Perfectionism**

This trait involves a meticulous nature and high standard for approval. The American Heritage Dictionary defines the term as “a propensity for being displeased with anything that is not perfect or does not meet extremely high standards”(Perfectionism). According to the AB5C scale, these people continue until everything is perfect and expect quality from themselves and others (Goldberg, Johnson and Eber).

### **Cautiousness**

In the context of this survey, this trait is tied to a lack of spontaneity. Cautious respondents are reserved, and think before acting. As defined by the American Heritage Dictionary, cautious is “tentative or restrained; guarded” (Cautiousness). Cautious customers are driven by facts, logic, and quality. They pay attention to quality and research thoroughly (Morris). This trait would naturally lead to longer search and selection.

### **Need for cognition**

This trait was found in the Handbook of Marketing Scales. The characteristic is defined by an enjoyment of thinking and processing ideas. The trait does not measure intelligence or critical thinking skills, but rather enjoyment of thinking as an action. Those who score high in Need for Cognition are more likely to pay attention to the content of an argument than peripheral cues and to seek out cognitive activities (Cacioppo and Petty).

## **Hypotheses**

The five traits measured in this experiment are assertiveness, understanding, perfectionism, cautiousness, and need for cognition. Survey questions corresponding to each trait are listed in the appendices.

### **H1: Assertive respondents choose fewer sites.**

Respondents who have high assertiveness scores make a decision and stick to it. If they choose to search through a page, they are less likely to go back to the search page to start over or pick another path.

### **H2: Assertive respondents penetrate deeper into sites.**

Along the same lines as H1, assertive respondents will view many pages within a site because they have already clicked on it, and want to explore within the route they have already selected.

### **H3: Understanding respondents use more sponsored links.**

Respondents who show high understanding may be more trusting or empathetic, which would lead them to use sponsored links since they have been placed there by others and are not mechanized in the same way as natural search results. They would also want to understand the opinions and recommendations of others.

**H4: Understanding respondents perceive lower search costs.**

Understanding respondents show empathy, and will feel that it takes less effort to do these tasks because they consider the feelings of others. By completing the task, they are helping another person (namely the researcher), so it will not seem like such a daunting task.

**H5: Perfectionist respondents are more persistent (i.e. more sites and total clicks).**

Perfectionists want the best camera possible, and will continue looking until thoroughly satisfied with the result. They will use more sites and total clicks because they will not be satisfied with the first choice, and will continue browsing.

**H6: Perfectionist respondents are less satisfied with the search process.**

Along the same lines as H5, perfectionists are unlikely to be happy with the results of their search when limited to only five minutes. They will feel that their choice is inadequate because they have not had the chance to fully explore and compare.

**H7: Perfectionist respondents are less satisfied with the resources used.**

Since perfectionists are unlikely to be satisfied with their results, they will be unsatisfied with the resources available to help them. Perfectionists would hold the resources to higher, difficult to attain, standards.

**H8: Cautious respondents use more sponsored links.**

Since sponsored links are paid placements from advertisers, cautious respondents know that someone has approved of them. They do not work impulsively and are likely to choose something that has been recommended by more than one site.

**H9: Cautious respondents use more of the allotted time.**

Cautious respondents will not settle on the first camera chosen, in case there is a better option available. They will work longer to allay their fears of making a mistake.

**H10: Cognitive respondents are more persistent (i.e. more sites and total clicks).**

Those respondents who have high need for cognition scores will likely search many places to compare cameras. They like to process information, and will need to go through many pages and sites to find the cameras to compare.

**H11: Cognitive respondents perceive lower search costs.**

Since cognitive respondents enjoy searching and processing information, they will feel that the search required little effort when compared to respondents who score low on the need for cognition inventory.

**H12: Cognitive respondents are more satisfied with the search process.**

Again, since cognitive respondents enjoy thinking and analyzing, they will be happier with the process overall.

## Method

### Selection

The participants in this experiment are all college students at the University of Arizona. College students are an important market for online advertising because “57% of U.S. online shoppers are college graduates or have some college education” (Krantz, 1998). In addition, the number of 18-24-year-old college students making purchases online increased from 43% in 1998 to 61% in 1999 (Gaffney, 2003). While college students do not give the entire picture of the online shopping industry, they are an appropriate and internally diverse sample to begin analyzing purchasing behavior.

Within the university campus, student selection was randomized. The researcher engaged students who were passing through the center of campus during lunch on various class days. This biases the selection toward students who are on campus in the middle of the day, and further toward those who were willing to participate.

No reward was offered for participation to ensure full effort and honest results. If payment or prizes were offered for completing the tasks, it may jeopardize the data collected by causing the subject to rush through the required tasks or to overstate the effort required for the experiment. As Festinger states, “the more rewarding a situation, the more negative is the effect; and contrariwise, the more painful a situation, the more positive is the effect” (Suedfeld).

The respondents each had to complete the task before beginning the survey. Since the survey asked questions about both the task and the respondent’s personality, it had to be completed after the task.

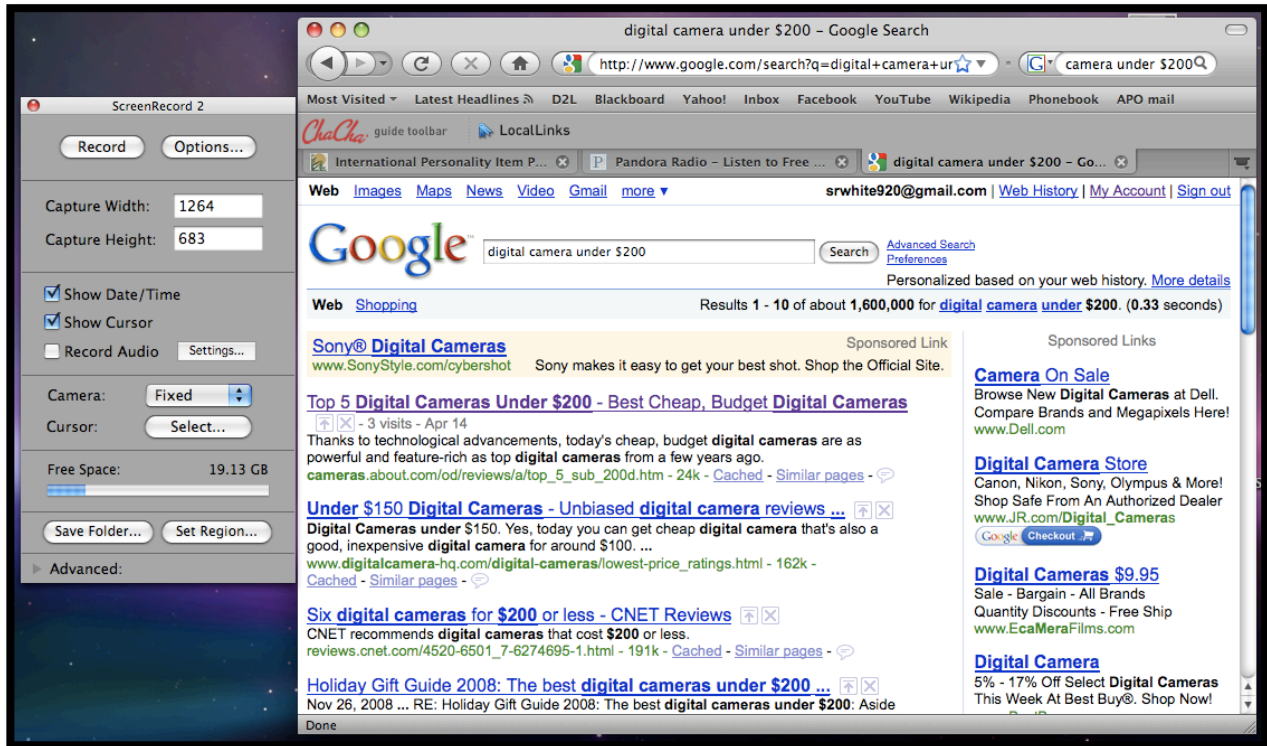
### Task

The experiment portion of this study comes in the form of an Internet search. Rather than asking the respondents about their behaviors, the study monitors the actions of consumers when given a certain task.

The search task required that the user begin the task from the Google search page. The standardization of the search engine ensured the same placement of results and sponsored link placements. The task requirements specified that the camera must cost under \$200 and have at least 3x optical zoom, 8 megapixels, and 2 color choices. The task was limited to 5 minutes with the start and stop of video screen capture delineating the time spent. The researcher kept track of time for the participants. The researcher notified the participants when there was one minute remaining, and stopped the task at five minutes. This length of time was shown to be appropriate because many participants utilized the entire time, but others finished the task with minutes to spare.

This task shows information search behavior in the context of online shopping. While the pre-purchase search is all that is analyzed, this can be extrapolated to the other parts of the shopping process. Even without the survey information, pieces of the search task show paths taken and common trends in online shopping behavior.

In order to analyze the footage of each online shopper, a program called ScreenRecord is utilized. The program shows the entire computer screen and records all mouse movement, typing, and scrolling. By recording footage of the entire search task, it is possible to discern search terms, pages visited, and path to the chosen camera. The startup window from ScreenRecord is displayed below.



This method for analyzing behavior is innovative because it allows the researcher to gather all necessary data without interfering with the respondent's behavior. The software is not invasive, and is not visible during searching. Rather than asking the respondent questions about searching or looking over his or her shoulder, this program creates a permanent record that captures more information than necessary. If another hypothesis or variable were tested using the same experiment design, all samples would still be valid, and could be rechecked for the new information.

This use of technology is part of a new frontier of market research, as the focus of the experiment is incorporated into the data collection. As more commerce moves to the Internet, it is likely that researchers will rely heavily on computer-based research. The effective use of technology in coordinating an experiment makes for simpler data analysis and more streamlined interaction with the respondent, as all of their tasks take place in the same medium.

## Survey

The survey consists of 60 questions, most of which are answered with a 5-point Likert scale. Each question is required, and the form is administered via Google Documents. The surveys for personality characteristics were drawn from the Marketing Handbook of Scales

and the International Personality Item Pool, and have already been tested for validity. A screen capture of the online survey is below.

Thesis Survey

Please answer the 60 questions below about yourself and the task you just completed.  
The response SA corresponds to "Strongly Agree" and SD corresponds to "Strongly Disagree."

\* Required

What number is on your form (circled in blue ink)? \*

21

I am satisfied with the camera I chose. \*

SA  
 A  
 N  
 D  
 SD

I feel that I made the best possible recommendation. \*

SA  
 A  
 N  
 D  
 SD

The first set of questions consists of general questions about the task and effort required, which will be dependent variables in the study. Demographic information was also collected in this section. These questions are used to measure against the personality traits, and are not a part of any personality inventory.

The second set of questions consists of questions from the personality inventories about each of the five traits to be measured. The sections have been mixed up to avoid bias from the respondent. Each question is in the form of a statement, and the respondent can strongly agree, agree, feel neutral, disagree, or strongly disagree. These measures will be the independent variable in this study.

## Analysis

In order to match the survey and search task, each participant was given a number that corresponded to both pieces of the experiment. The video of the participant's search was then matched to its survey and appropriate facts about both were entered into the table of results.

Before comparing variables, each survey question was assigned a value 1-5 that corresponded with its response. These numbers were then totaled for each trait. While a validity test is usually performed, these scales were borrowed from other inventories that

have already been tested for validity and edited accordingly. Some of the scales were carefully shortened by a few items beyond their given short scales to omit redundancy and keep the survey short enough to be manageable. While this should merit a new validity test, the changes were minor, so the research team decided the test would be unnecessary.

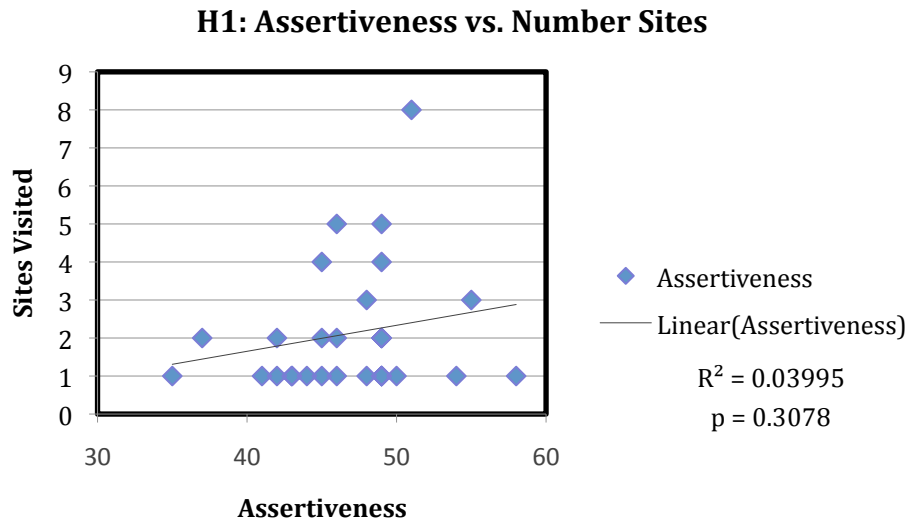
Once the results for each behavior and personality trait were calculated, the data was analyzed according to the hypotheses. The majority of hypotheses required a single linear regression, so the points were scatter plotted with the personality trait on the x-axis as the independent variable. The comparison variable, whether from the survey or search task, was plotted on the y-axis as the dependent variable. Once the points were plotted, a linear regression was added and the  $R^2$  coefficient of determination was displayed.

The R coefficient shows correlation between two variables, but the  $R^2$  coefficient shows the portion of variation in the data that is explained by the relationship suggested. For example, a relationship with a correlation of  $R=0.9$  would have a very strong relationship, and would have a relationship of  $R^2=0.81$ , which means 81% of the variation in the dependent variable is explained by the variation in the independent variable.

Some hypotheses measured yes/no variables from the task or survey, and cannot be tested meaningfully with linear regression. These were compared with a t-test comparing the means of the two groups (yes and no). The groups are differently sized and with differing standard deviations, and are considered independent of one another (as opposed to matched pairs). The average personality score of the "Yes" group was compared to the score of the "No" group to see if the difference is by chance or is too large to be random. The test was performed at a one-tail significance, because each hypothesis suggested that one was larger than the other, not that they differed in general.

## H1 Results

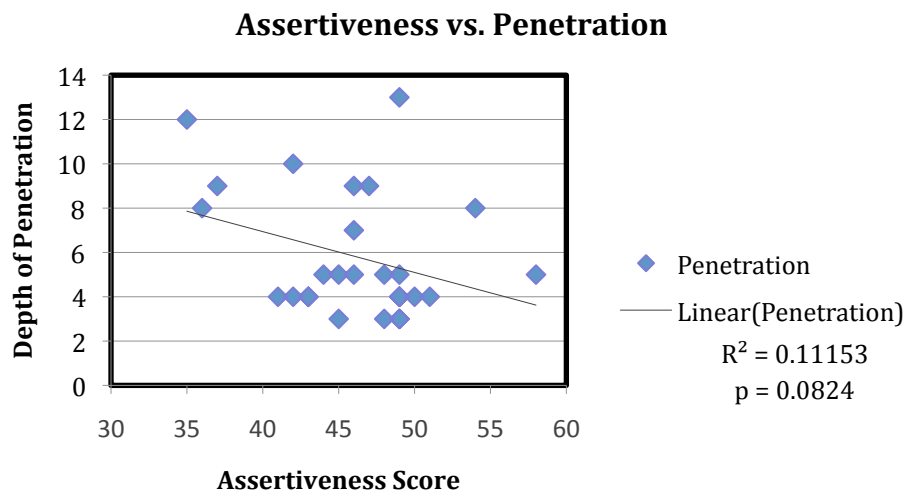
The relationship between assertiveness and total clicks proved to be insignificant. The p-value of 0.3078 is greater than 0.05, the maximum to be considered statistically significant. While this does not rule out a relationship between the two variables, this research does not support the conclusion that assertiveness affects the number of sites a person uses in a task. The model does not fit the data, thus, we reject the hypothesis that someone with more assertiveness will visit fewer sites. Furthermore, the coefficient of determination was only 0.04, which means that only 4% of the variation in total clicks is explained by assertiveness.



## H2 Results

Assertiveness has a somewhat stronger relationship to site penetration, but still only determines about 11% of the variation in the data.

The p-value of 0.08 approaches significance, but is still above the standard 0.05 acceptance level for statistical significance. This relationship is still not strong enough to conclude a relationship between the variables. In fact, the regression equation shows a slight negative slope between the variables, while the hypothesis suggested a positive correlation. Thus, our suggested model does not fit the data and we cannot conclude that assertiveness will positively impact site penetration.



### H3 Results

The t-statistic for this test is 1.16, but does not exceed the critical t-value of 1.7. The hypothesis that users of sponsored links are likely to be more understanding was not supported. The p-value of 0.12 exceeds the limit of 0.05, which means that the probability that there is no difference between the means is too high to accept with confidence.

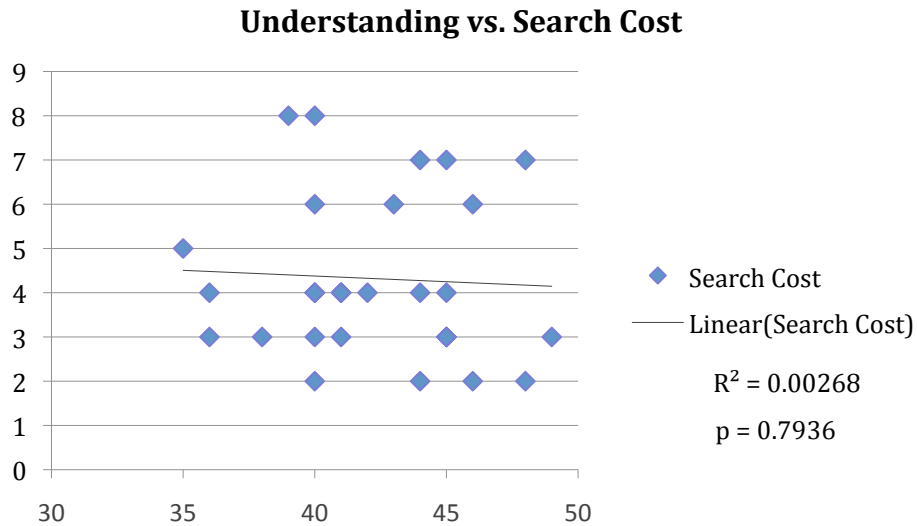
Since most statistical analyses assert that significance of 5% or less is required to make a claim of validity, this relationship cannot be said to be statistically significant. With such a high p-value, we reject the hypothesis that the mean understanding scores differ between sponsored link users and non-users.

<i>Statistic</i>	<i>Y</i>	<i>N</i>
Mean	43.11111111	41.73684211
Variance	3.861111111	18.42690058
Observations	9	19
Hypothesized Mean Difference	0	
df	26	
t Stat	1.161946948	
P(T<=t) one-tail	0.127906379	
t Critical one-tail	1.705617901	
P(T<=t) two-tail	0.255812758	
t Critical two-tail	2.055529418	

#### H4 Results

Statistically speaking, there is almost no relationship between understanding and search costs. The  $R^2$  coefficient of determination is 0.002, or less than 1% of the data explained by the linear relationship projected.

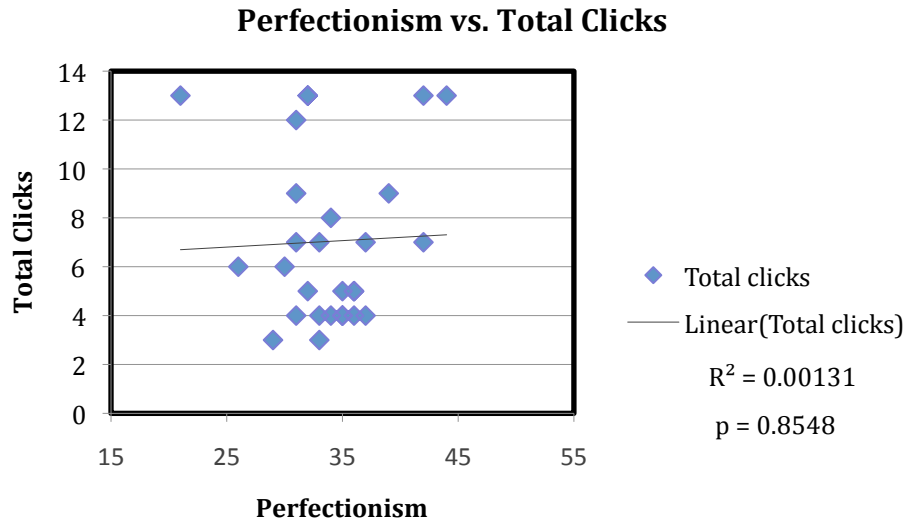
The p-value of 0.79 is far above 0.05, so the relationship is not statistically significant. The model does not fit the data, so the hypothesis is rejected. We cannot conclude that higher understanding scores predict lower perceived search costs.



### H5 Results

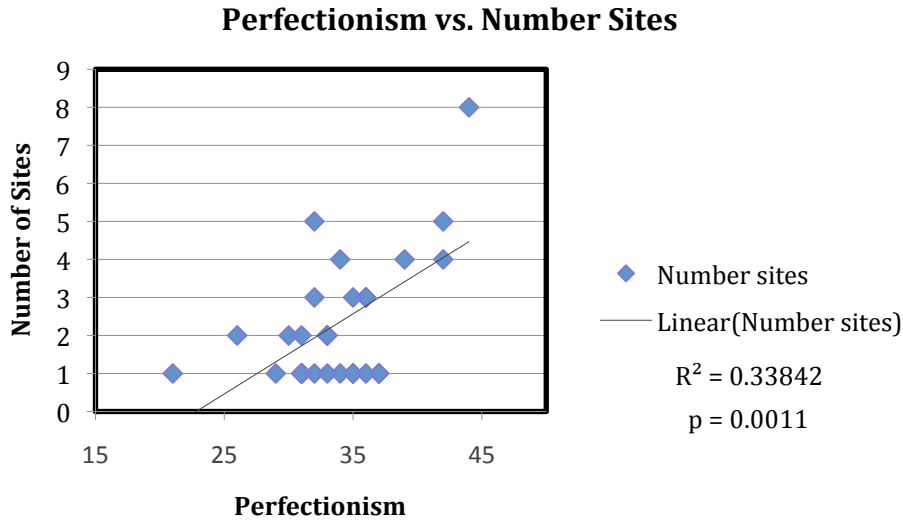
The relationship between perfectionism and total clicks is not conclusive, as the coefficient of determination is  $R^2=0.001$ , which means perfectionism scores explain less than 1% of the variance in total clicks.

The p-value of 0.85 is much higher than the maximum of 0.05 to be considered statistically significant, so we reject the hypothesis that higher perfectionism scores predict a greater number of total clicks. The model does not fit the data.



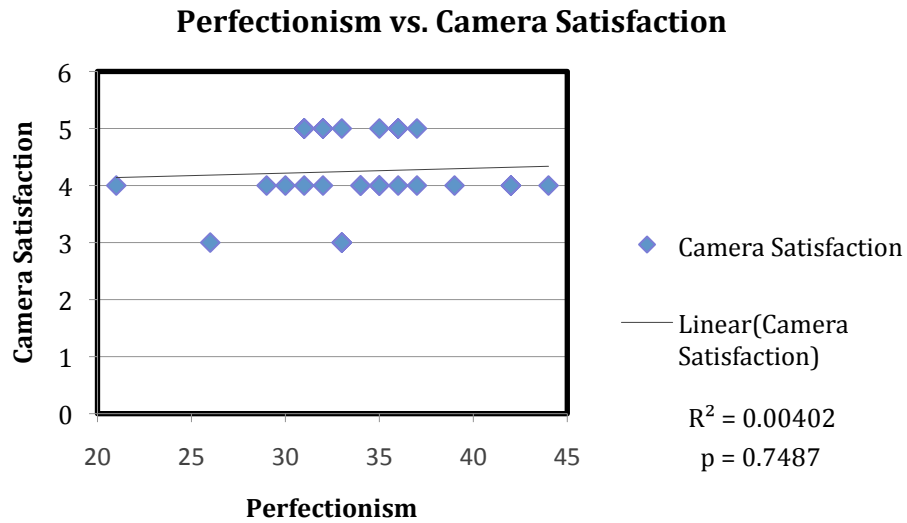
### H5-2 Results

Perfectionism shows a much stronger link with the number of sites visited. The relationship between the two has a coefficient of determination of  $R^2=0.33$ , which means 33% of the variation in number of sites visited is explained by the perfectionism trait. The p-value is 0.0011, which is extremely low and is highly significant. We can accept the hypothesis that perfectionism is positively related to the number of sites visited.



### H6 Results

No correlation between perfectionism and camera satisfaction was found. The coefficient of determination is  $R^2=0.004$ , or less than 1%. The p-value of this relationship is 0.74, which greatly exceeds the maximum acceptable value of 0.05. We reject the hypothesis that perfectionism influences camera satisfaction.



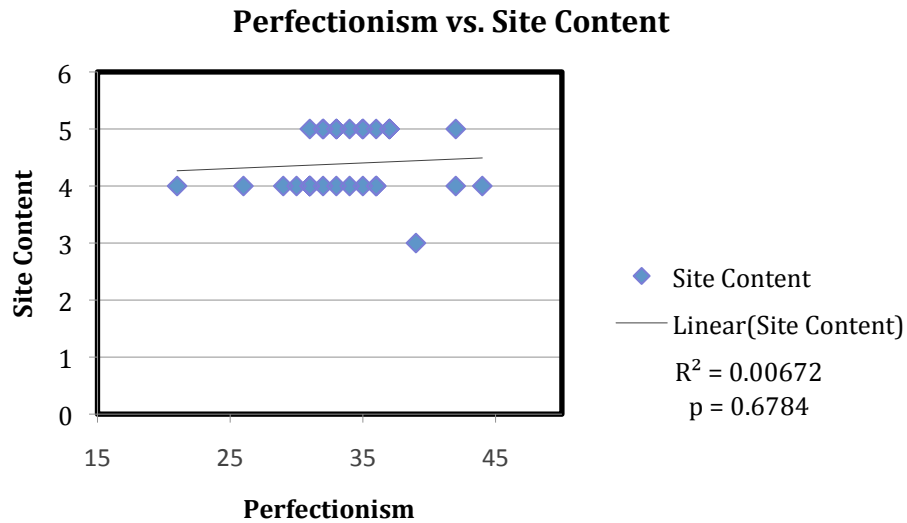
### H6-2 Results

Perfectionism is related to satisfaction with the final recommendation, which has a coefficient of determination of  $R^2=0.17$ . This corresponds to a correlation of  $R=0.419$  and p-value of 0.026. Since this value is less than 5%, the relationship is considered significant and we can state that perfectionism impacts recommendation satisfaction. Since the correlation is positive, the result was not expected, and the original hypothesis cannot be accepted. A new test should be explored with a positive relationship between perfectionism and recommendation satisfaction.



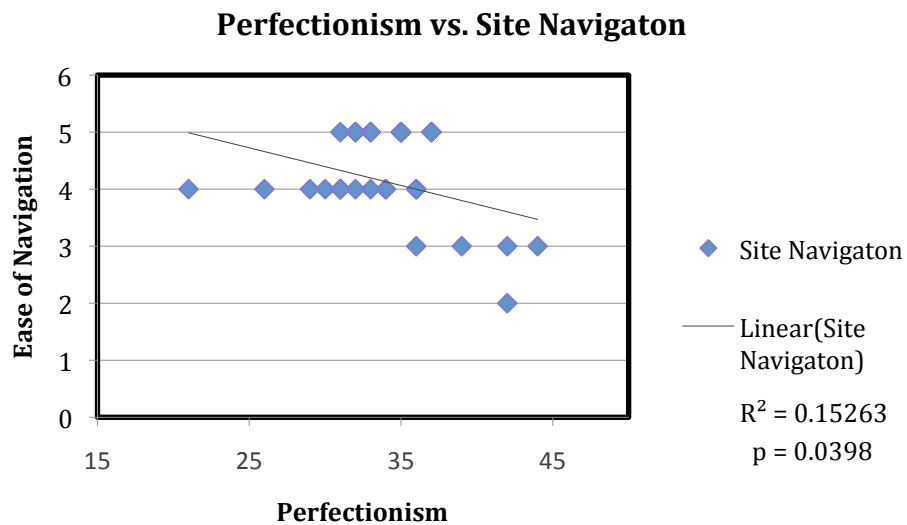
### H7 Results

Perfectionism and site content have little correlation. The coefficient of determination is  $R^2=0.006$ , or less than 1%. The significance of 0.67 is far too high to accept the hypothesis. The model does not fit the data.



### H7-2 Results

The relationship between perfectionism and site navigation is noticeable. The coefficient of determination is  $R^2=0.15$ , which would correspond to a correlation of  $R=0.391$ . The p-value of this relationship is 0.039, which is below 5% and can be considered statistically significant. With these strong numbers, we can accept the hypothesis that perfectionism negatively impacts satisfaction with site navigation.



### H8 Results

According to the t-test, sponsored link users have a higher cautiousness score on average. While this may not be a predictor, there is a connection between the two traits because the test significance is only 0.019, which means that one can say the mean cautiousness of sponsored link users is higher. There is only a 2% chance that the means are the same. With an accepted alpha of 0.05, we can accept the hypothesis that sponsored link users have a higher cautiousness score.

<i>Statistic</i>	<i>N</i>	<i>Y</i>
Mean	22.16666667	25
Variance	14.02941176	6.857142857
Observations	18	8
Hypothesized Mean Difference	0	
df	19	
t Stat	-2.214789309	
P(T<=t) one-tail	0.019596671	
t Critical one-tail	1.729132792	
P(T<=t) two-tail	0.039193342	
t Critical two-tail	2.09302405	

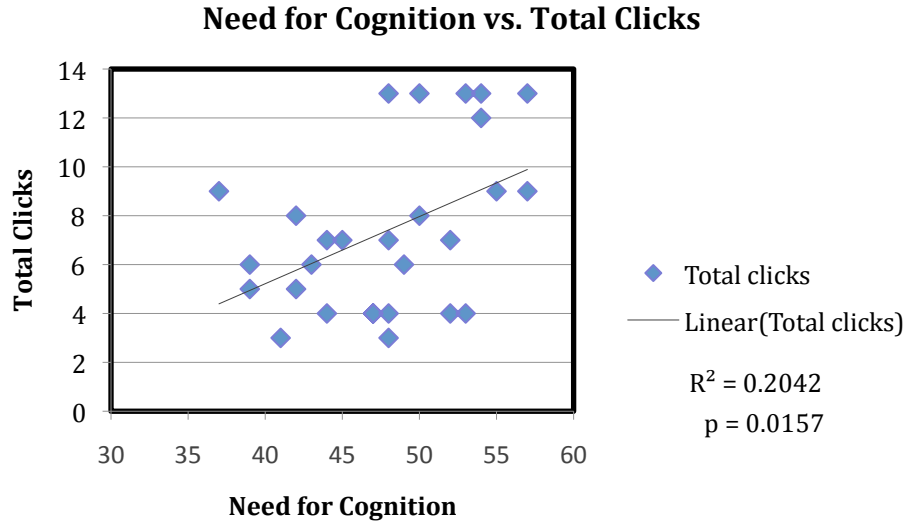
### H9 Results

The relationship between cautiousness and use of the allotted time shows no correlation. The means are nearly identical for the two groups, so it is unlikely that there is a major difference between them. The test significance is extremely close to 0, and is far from reaching the critical t. The p-value of 0.40 signifies that there is a 40% chance that the means are equal. This high probability does not suggest much confidence in the relationship, so we can reject the hypothesis that the means differ.

<i>Statistic</i>	<i>N</i>	<i>Y</i>
Mean	22.9375	23.3
Variance	13.2625	13.34444444
Observations	16	10
Hypothesized Mean Difference	0	
df	19	
t Stat	-0.246458924	
P(T<=t) one-tail	0.403985052	
t Critical one-tail	1.729132792	
P(T<=t) two-tail	0.807970104	
t Critical two-tail	2.09302405	

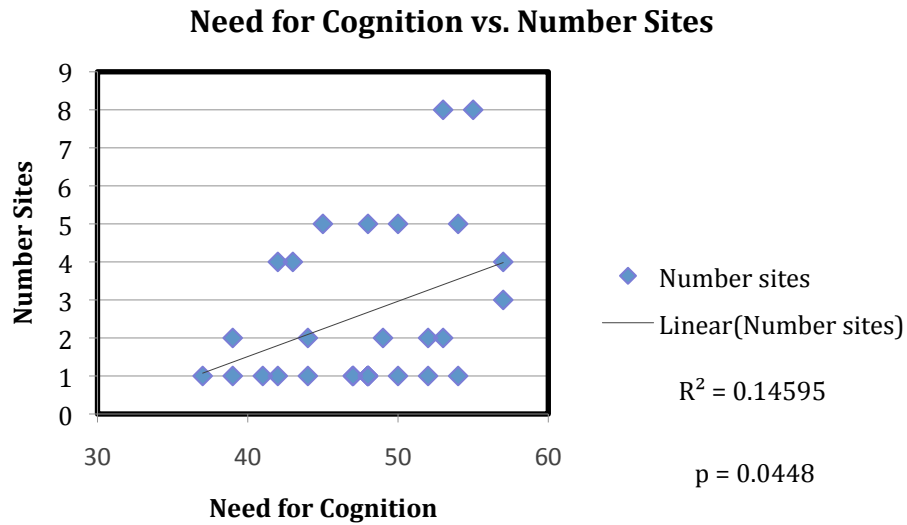
### H10 Results

The connection between need for cognition and total clicks made is strong. The coefficient of determination is  $R^2=0.2042$ , the correlation of 0.45 shows a solid positive relationship. The p-value of 0.01 is extremely low, which means the data is statistically significant. The  $R^2=0.2042$ , which means that 20% of the variation in total clicks, is explained by the variation in the need for cognition scores. This model fits the data.



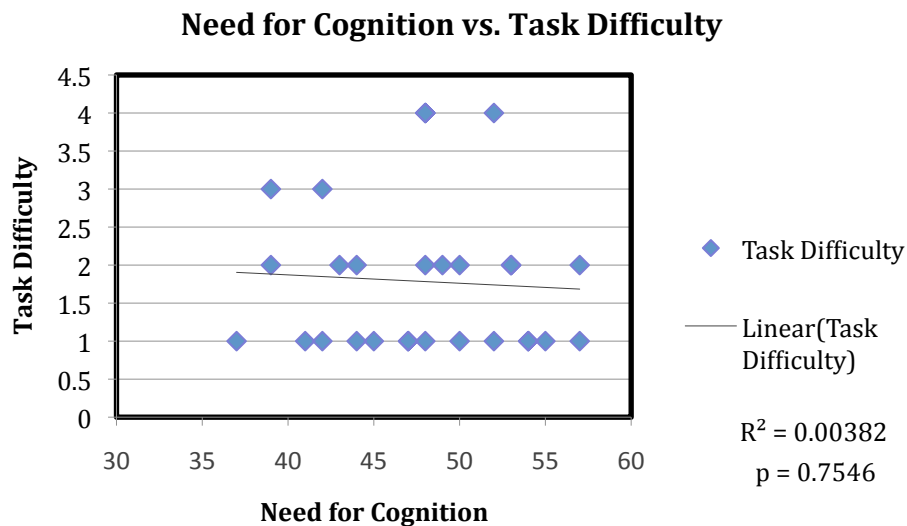
### H10-2 Results

The correlation between need for cognition and the number of sites visited is  $R=0.382$ , with a coefficient of determination at  $R^2=0.145$ . Only 14% of the variation in the number of sites is explained by variation in the need for cognition scores. The p-value of this test is 0.14, which is too high to accept at a 5% level of significance. The model does not fit the data.



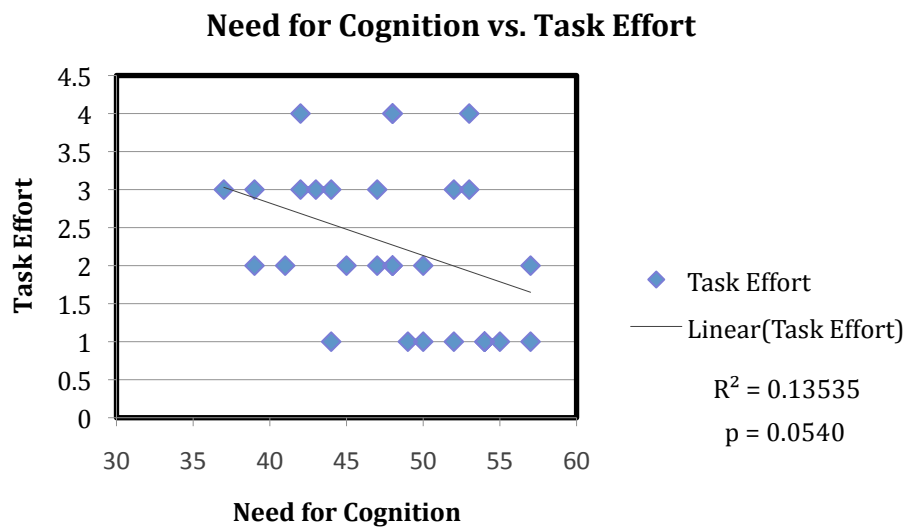
### H11 Results

The relationship between need for cognition and perceived task difficulty is minimal. The coefficient of determination is  $R^2=0.003$ , which is exceptionally low. The p-value of 0.75 is far above the maximum acceptable value of 0.05, so we can reject the hypothesis and say that the model does not fit.



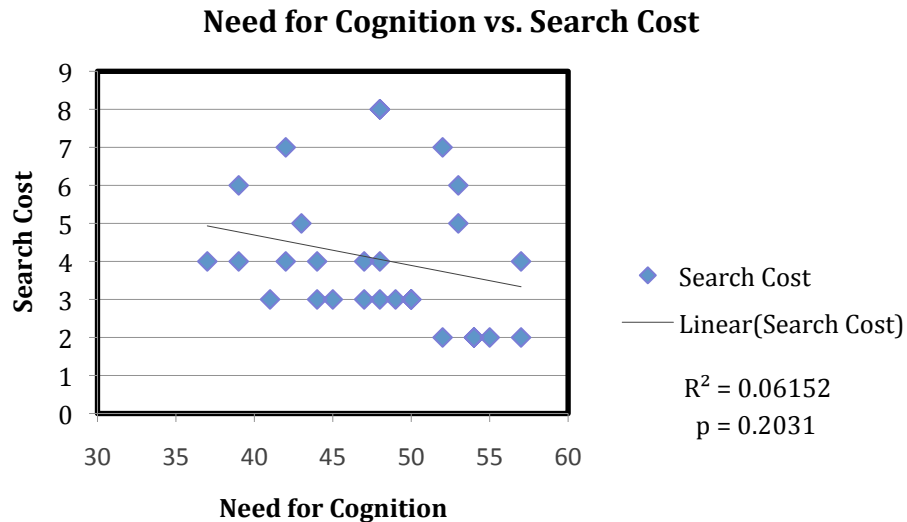
### H11-2 Results

The relationship between need for cognition and task effort shows a slight negative correlation. While this pairing has a coefficient of determination of  $R^2=0.135$ , it is the opposite of the hypothesis and definitely does not show the expected relationship. This hypothesis could use further analysis, but still only has a correlation of  $R=(-0.3678)$ , which does not definitively explain the relationship. The p-value of 0.0540 is over the maximum value of 0.05, but is very close to the significant range. The hypothesis is rejected, but the model should be reevaluated in the future.



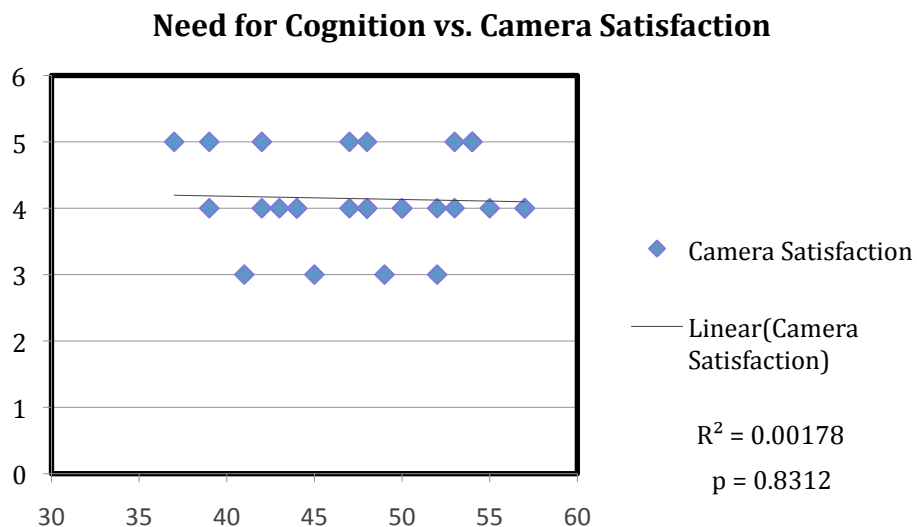
### H11-3 Results

The relationship between need for cognition and search cost is probable. The coefficient of determination is  $R^2=0.061$ , which explains only a small percentage of variance in the data. The p-value of 0.20 is above the maximum value of 0.05, and is not considered significant. This hypothesis is close to statistical significance, but is not within the critical range. Future testing of this relationship is warranted.



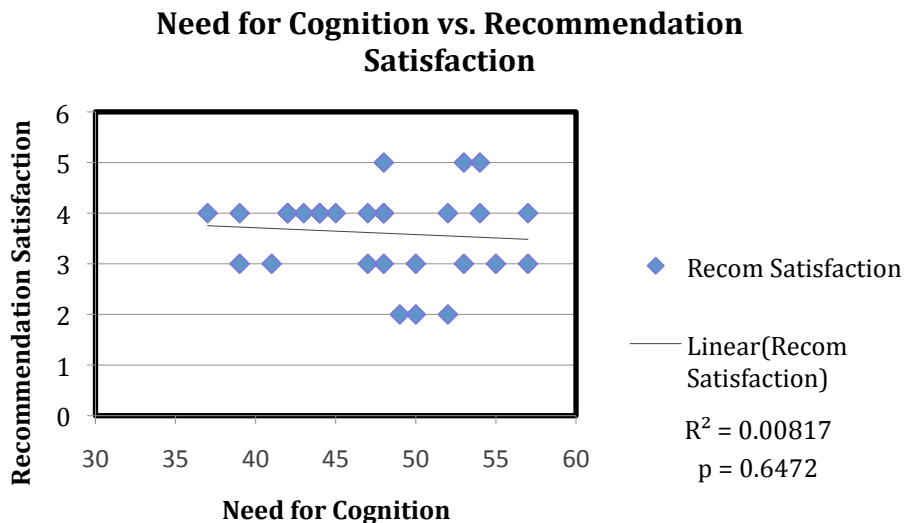
### H12 Results

There is no apparent relationship between need for cognition and camera satisfaction. The coefficient of determination is  $R^2=0.001$ , which suggests no relationship between the two variables. The p-value of 0.83 is far too high to accept, so the hypothesis is rejected and the relationship is not statistically significant.



### H12-2 Results

The relationship between need for cognition and recommendation satisfaction is inconclusive, with a coefficient of determination of  $R^2=0.008$ . This is extremely small, and means that this relationship does not explain very much of the variance in the (McCrae and Costa) data. The p-value is 0.64, which is too high to be statistically significant. We reject the hypothesis and assert that the model does not fit the data.



### Summary of Supported Relationships

Independent Variable	Dependent Variable	Correlation	P-Value
Perfectionism	Number Sites	Positive	0.0011
Perfectionism	Recommendation Satisfaction	Positive	0.0263
Perfectionism	Site Navigation	Negative	0.0398
Cautiousness	Sponsored Links	Positive	0.0195
Need for Cognition	Total Clicks	Positive	0.0157
Need for Cognition	Number Sites	Positive	0.0448

### Discussion

Six of the relationships tested were significant, and will be further discussed. Some of the hypotheses tested were not statistically significant, and will not be analyzed further. While it is possible that these variables are not correlated, specific instances (or people) may fall into the expected ranges.

According to mathbits.com, a correlation is considered strong if its coefficient  $R > 0.8$ . The correlation of perfectionism vs. number of sites is about 0.58, which is not considered strong, but is the highest in this study (Correlation Coefficient). On the other hand, the

links between personality and behavior are tenuous, and can be measured by a different scale. Researchers Robert McCrae and Paul Costa claim that a correlation of 0.40 in personality/behavior relationships would be “quite respectable.” According to their studies on personality and behavior, 0.30 is a moderate correlation and anything over 0.50 is considered a strong correlation (McCrae and Costa). In terms of  $R^2$ , a coefficient of determination of 0.09 is a moderate relationship and 0.25 is a strong relationship.

The relationships between perfectionism, number of sites, recommendation satisfaction, and site navigation satisfaction are all significant at the 5% level. Other significant findings are the relationship between cautiousness and sponsored links, need for cognition and total clicks and number of sites. Two of the tests, assertiveness versus penetration and need for cognition versus task effort, both had p-values under 10%, but were out of range of 5% significance. While many of the hypotheses consisted of multiple tests, they can be said to be plausible if any one of the measures is significant. For example, the perfectionist respondents’ satisfaction with the cameras they chose was not statistically significant, but their satisfaction with their recommendations were significant at the 2.6% level. While the generalization of outcome satisfaction cannot be made, the link between recommendation satisfaction and perfectionism is interesting in itself.

There was a significant relationship between number of sites utilized and both perfectionism and need for cognition. A possible explanation for both hypotheses’ significance is overlap between need for cognition and perfectionism as personality traits. If respondents who were perfectionists also had high need for cognition, they would clearly share the same relationship. Another possibility is a third trait that overlaps with both need for cognition and perfectionism, such as determination. If this external variable correlated with both of the other traits, it would explain the similar relationship with number of sites utilized. A third explanation would be that both types of respondents simply use more sites. Perhaps the two personality traits are not correlated at all, but still lead to the same conclusion.

The supported relationship between cautiousness and sponsored links suggests that cautious respondents are more likely to use at least one sponsored link in their search than non-cautious respondents. Perhaps this use of sponsored material suggests a need for peer-review and rating of sites. If the cautious respondent does not want to use a wildcard site, he or she can depend on a sponsored link to be supported by someone. Since the respondents were not interviewed, it is not known why the subjects chose to use sponsored links, and it cannot definitively be stated.

Need for cognition has a strong relationship with total clicks, but also with number of sites. There is a possibility that the total number of clicks is only high because of the correlation with the number of sites visited. In order to separate the variables, site penetration would also need to be compared to the personality trait and possibly to the number of sites. Instead of correlation, to separate these linked variables, a different experiment would need to be designed or other tests would have to be run.

The hypothesis on perfectionism versus process satisfaction suggests that perfectionists will be less satisfied with the ease of navigation of the sites they used. While the hypothesis

suggests that the perfectionists have unreasonably high standards, and would be less likely to be satisfied with available resources, this could be an inaccurate assumption. There is a chance that the perfectionists happened to use poorly designed sites, and are not any more critical than other users.

In analyzing the statistics of the experiment, it is important to remember that numbers have little meaning without context. While statistically significant relationships have been observed in this study, they have not been explored. In order to make legitimate conclusions about the intent of searchers, qualitative research needs to be conducted to find out the motivation and reasoning for the behavior in the search task.

## Managerial Implications

As far as online advertisers are concerned, sponsored links can be effective. The results of this study show that sponsored link users are more likely to have cautious personalities. While this can be useful for all marketers, it is especially useful for those whose consumers are identified as cautious. These advertisers would benefit most from search engine marketing and sponsored links. This does not rule out the importance of natural search results, because the yes/no format of the question made it possible for respondents to use at least one sponsored link and still use natural search results.

The link between perfectionists and cognitive subjects and number of sites visited hints that those respondents continue searching deeper into the engine, and may value links farther down the page or that come from a later query. This means that companies targeting perfectionist personalities may not benefit in the same way from paying for sponsored links or gunning for top positioning on the search page. Since these consumers visit many pages, position may not be as important as some other differentiating factor. If consumers visit an average of three sites, they may look for outstanding keywords or original page titles.

The hypothesis that perfectionists are less satisfied with their recommendations was rejected. There was a statistically significant positive relationship between the two, meaning that perfectionists were more likely to be satisfied with their recommendations. This is a logical conclusion because perfectionists visit more sites, so they may feel that they have done a thorough search and found the best camera available. Since they have such high standards, they could feel that any camera that met their needs would be acceptable for the task requirements. This could lead to a future study on sponsored link usage and perfectionism. If the perfectionist subjects feel confident in their own abilities to find the proper resources, maybe they are less likely to use others' suggestions in the form of a sponsored link.

Perfectionists are less satisfied with the navigation of sites they used. This could be helpful to companies with perfectionist consumers, because it could indicate that they should spend money on redesigning their site rather than advertising on search pages. If a customer cannot get to the desired page within a site, he or she may stop browsing and go to another site. If these perfectionist consumers are unhappy with navigation, they are much more likely to abandon a site if they get frustrated. An important study for marketers

at these companies would be finding the most popular pages and the most often abandoned pages. If the company could analyze the pages that need the most traffic and exposure, they could feature them in simple, easy to read displays. Conversely, the pages with high abandonment could be redesigned to display information differently or offer more links to other pages within the site.

Without analyzing the motivation and intent of consumers, this survey explains behavioral patterns in relation to personalities. If companies can successfully segment their customer base into combinations of these traits, they can predict a set of behaviors. By offering personality tests to a focus group of consumers, companies could make their online shopping experiences more effective and profitable. For example, if a brand determined that a large segment of its customers were assertive, cognitive perfectionists, they could consider a flashy page with minimal outside advertising. Rather than paying for sponsorships or attempting to link to many other sites to draw traffic, they could make their site pop out from the middle of the search results. The marketers would know that a large segment of consumers are likely to scan the search page and visit multiple sites, so they could focus on holding the interest of the shopper and making the product easy to find once the consumer had entered the site.

## Limitations and Further Research

The first limitation of this survey is the sample. Since the group of participants was only a pool of university students, it does not represent the entire population. The sample also consisted of 30 people, which is enough for a t-test and some analysis, but cannot lead to conclusive results on a large scale. For further research, a larger sample of a more diverse group should be taken.

Another limitation to the web search analysis is experience. Since there is no question on expertise with cameras or online shopping, it is difficult to know how comfortable participants are with the process of finding a camera. Those participants who have experience may bypass most search engine results to go to a specific site, or may look for a particular camera that they have purchased or researched in the past. These shortcuts of shopping could skew results, because there is inherent knowledge that is not factored into the search analysis.

It is also difficult to separate facets of personality. While one behavior may be attributed or correlated with a trait, it could be a combination of traits or simply be misattributed to a similar characteristic. This is one of the major critiques of personality tests in general, but especially applies to research regarding the correlation between behaviors and traits.

The design of the search task also caused problems for analyzing results. Since the task was only five minutes long, and participants could reach the camera in as few as three clicks, the variation is not very large, making it difficult to find any sort of linear relationship. This same problem appeared in the survey. Since respondents only had five options, there are only five possible scores, making it difficult to scatter plot with any high level of correlation or determination. If instead of a five-minute task, the subjects performed three search tasks back-to-back, there would be a bigger spread of data.

## Appendices

### Search task form

Task 1—Duration: 5 minutes

Using only the Google search engine, you have 5 minutes to find the best digital camera available. Keep in mind, the camera must cost under \$200 and have at least 8.0 megapixels, 3x optical zoom, and 2+ color choices.

Before you begin searching, press spacebar to begin screen capture. When you have completed your task and chosen a camera, hold down command + option to end screen capture.

Brand: \_\_\_\_\_

Model: \_\_\_\_\_

Site: \_\_\_\_\_

### Survey questions, sorted by subject

Please answer the 60 questions below about yourself and the task you just completed.

The response SA corresponds to "Strongly Agree" and SD corresponds to "Strongly Disagree."

Section 1					
1. I am satisfied with the camera I chose.	SA	A	N	D	SD
2. I feel that I made the best possible recommendation.	SA	A	N	D	SD
3. Finding a camera that met all of the requirements was hard.	SA	A	N	D	SD
4. I put a lot of effort into this task.	SA	A	N	D	SD
5. Websites that I used had the content I needed to complete the task.	SA	A	N	D	SD
6. The sites I used were easy to navigate.	SA	A	N	D	SD
7. I use a computer often.	SA	A	N	D	SD
8. Do you own a digital camera?			Y		N
Section 2					
Assertiveness					
9. Automatically take charge.	SA	A	N	D	SD
10. Can easily push myself forward.	SA	A	N	D	SD
11. Try to lead others.	SA	A	N	D	SD
12. Turn plans into actions.	SA	A	N	D	SD
13. Stick up for myself.	SA	A	N	D	SD
14. Am always busy.	SA	A	N	D	SD
15. Come up with a solution right away.	SA	A	N	D	SD
16. Do a lot in my spare time.	SA	A	N	D	SD
17. Know what I want.	SA	A	N	D	SD
18. Let myself be pushed around.*	SA	A	N	D	SD
19. Am not highly motivated to succeed.*	SA	A	N	D	SD
20. Need a lot of time to do things.*	SA	A	N	D	SD

<b>Understanding</b>					
21. Sympathize with others' feelings.	SA	A	N	D	SD
22. Respect others' feelings.	SA	A	N	D	SD
23. Take others' interests into account.	SA	A	N	D	SD
24. Like to be of service to others.	SA	A	N	D	SD
25. Appreciate the viewpoints of others.	SA	A	N	D	SD
26. Feel little concern for others.*	SA	A	N	D	SD
27. Am not interested in other people's problems.*	SA	A	N	D	SD
28. Am indifferent to the feelings of others.*	SA	A	N	D	SD
29. Take no time for others.*	SA	A	N	D	SD
30. Can't be bothered with other's needs.*	SA	A	N	D	SD
<b>Perfectionism</b>					
31. Continue until everything is perfect.	SA	A	N	D	SD
32. Want every detail taken care of.	SA	A	N	D	SD
33. Want everything to be "just right."	SA	A	N	D	SD
34. Want things to proceed according to plan.	SA	A	N	D	SD
35. Demand perfection in others.	SA	A	N	D	SD
36. Keep a sharp eye on others' work.	SA	A	N	D	SD
37. Expect dedicated work from others.	SA	A	N	D	SD
38. Am not bothered by messy people.*	SA	A	N	D	SD
39. Am not bothered by disorder.*	SA	A	N	D	SD
<b>Cautiousness</b>					
40. Purchase only practical things.	SA	A	N	D	SD
41. Tend to dislike impulsive people.	SA	A	N	D	SD
42. Take precautions.	SA	A	N	D	SD
43. Do crazy things.*	SA	A	N	D	SD
44. Often make last-minute plans.*	SA	A	N	D	SD
45. Am easily talked into doing silly things.*	SA	A	N	D	SD
46. Laugh at the slightest provocation.*	SA	A	N	D	SD
47. Like to laugh out loud.*	SA	A	N	D	SD
<b>Need for cognition</b>					
48. I really enjoy a task that involves coming up with solutions to problems.	SA	A	N	D	SD
49. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.	SA	A	N	D	SD
50. Learning new ways to think doesn't excite me very much.*	SA	A	N	D	SD
51. The notion of thinking abstractly is not appealing to me.*	SA	A	N	D	SD
52. I only think as hard as I have to.*	SA	A	N	D	SD
53. I like tasks that require little thought once I've learned them.*	SA	A	N	D	SD
54. I prefer to think about small daily projects to long-term ones.*	SA	A	N	D	SD
55. I find little satisfaction in deliberating hard and for long hours.*	SA	A	N	D	SD
56. I don't like to have the responsibility of handling a situation that requires a lot of thinking.*	SA	A	N	D	SD
57. Thinking is not my idea of fun.*	SA	A	N	D	SD
58. I prefer my life to be filled with puzzles that I must solve.	SA	A	N	D	SD
59. I would prefer complex to simple problems.	SA	A	N	D	SD
60. It's enough for me that something gets the job done, I don't care how or why it works.*	SA	A	N	D	SD

## Results tables

Assertiveness	# Sites	Penetration
P-values	0.3078	0.0824
35	1	12
37	2	8
41	1	9
42	1	4
42	2	4
43	1	10
43	1	4
44	1	4
45	2	5
45	4	5
45	1	3
46	1	7
46	5	5
46	2	9
48	1	9
48	3	5
49	1	3
49	4	3
49	2	4
49	5	13
49	2	3
49	1	4
49	1	4
50	1	5
51	8	4
54	1	4
55	3	8
58	1	5

Understanding	Sponsored	Search Cost
P-values	0.1279	0.7936
35	N	5
36	N	4
36	N	3
38	N	3
39	N	8
40	N	4
40	N	4
40	N	2
40	N	8
40	N	3
40	Y	6
41	N	4
41	Y	3
41	Y	4
42	N	4
43	Y	6
44	N	2
44	Y	7
44	Y	4
45	N	4
45	Y	3
45	Y	7
45	Y	3
46	N	6
46	N	2
48	N	7
48	N	2
49	N	3

Perfectionism	Total clicks	Number sites	Camera Satisfaction	Recom Satisfaction	Overall Satisfaction	Site Content	Site Navigation
P-values	0.8548	0.0011	0.7487	0.0263	0.1164	0.6784	0.0398
21	13	1	4	2	6	4	4
26	6	2	3	2	5	4	4
29	3	1	4	4	8	4	4
30	6	2	4	3	7	4	4
31	4	1	5	5	10	4	4
31	7	2	5	4	9	5	5
31	9	1	4	4	8	4	4
31	12	1	5	4	9	4	4
32	5	1	5	4	9	5	5
32	13	5	5	4	9	5	5
32	13	3	4	3	7	4	4
33	3	1	3	2	5	4	4

33	4	2	3	3	6	5	5
33	7	2	5	5	10	5	5
34	4	1	4	4	8	5	4
34	8	4	4	4	8	4	4
35	4	1	4	4	8	5	5
35	4	3	5	4	9	5	5
35	5	1	4	4	8	4	5
36	4	1	4	4	8	4	3
36	5	3	5	5	10	5	4
36	5	3	5	4	9	4	4
37	4	1	5	3	8	5	5
37	7	1	4	3	7	5	5
39	9	4	4	4	8	3	3
42	7	4	4	5	9	5	2
42	13	5	4	5	9	4	3
44	13	8	4	3	7	4	3

Cautiousness	Sponsored	Time Utilized
P-value	0.0195	0.4039
15	N	Y
17	N	N
17	N	N
18	N	Y
18	Y	Y
19	N	N
19	N	N
19	Y	Y
20	N	N
20	N	N
21	N	N
21	N	N
22	N	N
23	N	N
23	N	N
23	N	Y
24	Y	Y
25	Y	Y
26	N	N
26	N	N
26	Y	N
26	Y	Y
26	Y	Y
27	N	N
27	Y	Y
27	Y	Y
28	N	N
29	N	N

Need for Cognition	Total Clicks	Number Sites	Task Difficulty	Task Effort	Search Cost	Camera Satisfaction	Recom. Satisfaction
<b>P-Values</b>	<b>0.0157</b>	<b>0.0448</b>	<b>0.7546</b>	<b>0.0540</b>	<b>0.2031</b>	<b>0.8312</b>	<b>0.6472</b>
37	9	1	1	3	4	5	5
39	5	1	2	2	4	5	5
39	6	2	3	3	6	4	5
41	3	1	1	2	3	5	5
42	5	1	1	3	4	4	3
42	8	4	3	4	7	5	5
43	6	4	2	3	5	4	4
44	4	1	1	3	4	4	5
44	7	2	2	1	3	5	5
45	7	5	1	2	3	3	4
47	4	1	1	3	4	4	4
47	4	1	1	2	3	5	5
48	3	1	4	4	8	4	5
48	4	1	2	2	4	5	4
48	7	1	4	4	8	2	5
48	13	5	1	2	3	4	5
49	6	2	2	1	3	4	5
50	8	5	1	2	3	4	5
50	13	1	2	1	3	4	3
52	4	1	4	3	7	4	5
52	7	2	1	1	2	5	5
53	4	2	2	4	6	3	5
53	13	8	2	3	5	5	5
54	12	1	1	1	2	4	5
54	13	5	1	1	2	5	5
55	9	8	1	1	2	4	3
57	9	4	1	1	2	3	5
57	13	3	2	2	4	4	5

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