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Running Head: ADVERSE ADVERTISING

The Rochester Institute of Technology

Department of Communication

College of Liberal Arts

Adverse Advertising:
The impact advertisements have on webpage content retention

by

David P. Keppel

A Thesis submitted

in partial fulfillment of the Master of Science degree

in Communication & Media Technologies

Degree Awarded:
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Dedication

To my parents, who have always been there to help me along my path and encouraged my dreams; to my Beautiful Star, who taught me the value of perseverance in completing any task; and Dr. James Laux, who woke me up and helped me to realize my true potential.

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ADVERSE ADVERTISING:
THE IMPACT ADVERTISEMENTS HAVE ON WEBPAGE CONTENT RETENTION

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Abstract

This study examined the effect of Web-based advertising on Webpage content retention. A single-factor experiment was conducted on three groups of subjects (n=105). Each of the three groups differed only regarding the absence or presence of advertisements and the congruity of these advertisements to the thematic design of the Webpage and the informative content. A post-experimental questionnaire assessed the subject's retention of Web page content as well as the subject's retention of any present advertisements. The results suggest advertisement presence significantly reduces a subject's ability to retain informative content. The results do not suggest the congruity of the advertisement to the content affects retention of either the advertisement or the informative content.

Keywords: Internet Advertising, Advertising Effects, Retention, Limited-Capacity Information-Processing Model.

Adverse Advertising:

The Impact Advertisements have on Webpage Content Retention

The Internet began as a way to share information among users across small closed networks. The web formed by this mass medium very quickly began to expand allowing users to access information from around the world. However, the Internet changed in 1994 with the appearance of the first commercial banner advertisement (Cho & Cheon, 2004). By 1997, the Interactive Advertising Bureau proudly announced the amount of revenue collected among its global members for the placement of online advertising had reached \$267 million in the previous year.

Today, Internet advertising represents the most diverse advertising initiative ever attempted across a single medium, by using and melding text, sound, images, videos, and interactive elements¹ into various advertisement formats². The effectiveness of these advertisements, however, is constantly waning as the most effective forms of advertising quickly over-saturate the market. This over saturation forces advertisers to develop new techniques to attract consumer attention. These techniques include the integration or animation, interactivity,

1. Interactive elements within advertisements are simple games that are “played” by clicking the mouse on the advertisement. However, the act of clicking the advertisement to play the game causes the browser to open a new browser window to the advertiser’s web site.

2. Burns and Lutz (2006) identified six different forms of Internet advertising which include the banner, usually located at the top of the pages; the skyscraper, vertically oriented down the right or left side of the page, the box or animated box advertisement, usually located on the right or left side of the page; the inline advertisement usually inserted amidst the text; and the pop-up or pop under advertisement which appears in a separately opened window. Several variations on these advertisements have since appeared across the Internet.

bright colors, sound, and congruity between thematic elements and content into the design and appeal of the advertisement (Lohtia, Donthu, & Hershberger, 2003; Moore, Stammerjohan, & Coulter, 2005). These methods are used to design advertisements which appear on the periphery of the page and occasionally amidst the page's content in an attempt to attract the user's attention long enough to form mental impressions, which Burns and Lutz (2006) suggest makes an advertisement effective.

The question then becomes how much one can concentrate on the content of the web page amidst the distractions presented by the advertisements. Lang's (2000) limited-capacity information-processing model posits that the brain allocates only a certain amount of the limited available mental resources to accomplish tasks such as information retention. These mental resources are responsible for encoding information into memory for later recall. Since the mental resources are limited, the brain only allocates the minimum amount of mental resources required to accomplish a task. Distractions, such as advertisements, tax these limited resources resulting in an incomplete encoding and storage of the content and the advertisement, thus resulting in an inability to later recall details of either the content or the advertisements.

As advertisements continue to permeate the content of the Internet, studies into the effects of Internet advertising become increasingly important not only in determining the presence of any advertising effects, but also in determining the extent of any present advertising effects. The purpose of the present study is to

explore the effect Web-based advertising has on a subject's ability to retain Web page content. Specifically, this study attempts to answer whether the presence or absence of advertising, as well as whether the degree of congruity between advertisement and Web page, leads to a subject's differential recall of both the content and the advertisement.

Rationale

Social

Burns and Lutz (2006) stated the perception of Internet advertising by many users ranges from indifference to a deep sense of perceived intrusiveness. However, few consider the possibility that the mere presence of advertising may be detrimental to one's ability to retain informative content, due in part, perhaps, to advertising's permeation through everyday life.

Ultimately, the present study seeks to enumerate the effects of exposure to Internet advertising as measured through experimentation. The results of these experiments will attempt to inform the public of any adverse effects of advertisements on the Internet. In addition to societal benefits, the present study also seeks to provide advertisers with information concerning the mitigation of adverse advertising effects while increasing the retention of advertisements among users.

Scholarly

The majority of research done on Internet advertising over the last ten years has focused on Internet advertising effectiveness rather than Internet advertising

effects. The present study seeks to contribute to the overall understanding of how the presence of advertisements on Web pages affects retention ability through experimentation.

Similarly, the limited capacity theory offers a limited amount of research as it relates to the Internet due, in large part, to its relative infancy as a theory. However, as a model of information processing it has been highly praised. The application of this model to the findings of this study could create new avenues of understanding and research on how the human brain perceives and processes information through the interpretation of the experimental results. Additionally, this study represents a fresh look into the question of how the processes of the limited-capacity model can be applied to the brains interaction with one of the most popular and diverse forms of media currently in use.

This study seeks to augment academia by furthering research in the area of Internet advertising effects and the limited-capacity theory, by producing new lines of research into both the findings and interpretation of the results garnered by this experiment, and to inspire future research into the realms of Internet advertising effects and the limited-capacity model still left unstudied.

Literature Review

Previous research has studied the effects of advertising through a variety of media. Beginning with Harlow Gale's first advertising surveys and experiments concerning advertising effects in 1900, advertising research has since evolved through Gale's contemporaries to the present day (Eighmey & Sar, 2007). Most

recently, the Internet has offered new avenues in advertising research as this new medium grows and old medium dissolves into its web. For the purpose of this study, available research on limited capacity theory, which addresses how the brain processes incoming information; Internet advertising effectiveness, which aids the creation of the proposed experiment; and Internet advertising effects is primarily considered.

Limited Capacity Theory

According to Harris (2004), the limited capacity model is one of the most influential recent cognitive models of media information processing, because it is drawn from basic ideas of cognitive psychology. Lang (2000) refers to her theory as an “amalgam of the many information-processing models developed over the past 30 years” (p. 47). The model builds on two major assumptions: people are information processors; and a person’s ability to process information is limited. Processing involves the allocation of a limited number of mental resources to the task of encoding of the information so it may be recalled later. Because these resources are limited, the brain only allocates the absolute minimum necessary to process incoming information.

The allocation of mental resources to any task stands at the heart of the limited-capacity information-processing model. According to Lang (2000), the allocation process can be either automatic or controlled. Controlled allocation reflects one’s conscious goals, such as committing a phone number to memory. Automatic allocation is unintentional and activated by two major types of stimuli,

goal / need relevance and unexpected environmental occurrences. For example, a man driving a car home from work is thinking about three things, driving, tomorrow's schedule, and dinner (controlled allocation). Suddenly, an oncoming car swerves into his lane. Immediately automatic allocation of resources takes over, shifting the resources tied up with tomorrow's schedule and dinner to the unexpected environmental occurrence presented by the oncoming car.

To process a message, such as the content of a newspaper article, the brain must add the processes of encoding and storing before a later retrieval can occur. Both of these processes also draw upon the brain's limited mental resources. Lang (2000) argues that thorough processing of a message can only occur if the brain allocates enough resources to complete the tasks of encoding and storing. If the brain allocates too few resources, or the message is larger than the allocated resources, the brain cannot thoroughly process the incoming message.

The question then becomes one of logistics. If a Web page has content and advertisements, why does the brain not simply allocate the amount of resources required to encode and store an entire page? The answer is based on the concept of controlled allocation of resources reflecting one's goal / need relevance. Quite simply, the goal is to retain the content and nothing else. The brain then allocates the amount of resources required to retain only information relevant to one's goal or need.

To account for the unique nature of the Internet, Lang, Borse, Wise, and David (2002) adapted the limited-capacity information-processing model. This

reorientation accounts for the presence of information that is not strictly audio or visual. To do this, Lang et al. (2002) included the measurement of orienting responses to the limited-capacity information-processing model. Orienting responses are the result of presence of novel stimuli, which denote change in an environment, and signal stimuli, which signal the advent of relevant information. Lang et al. (2002) then designed an experiment to determine if the computer environment could elicit orienting behaviors to flashing text and advertisements displayed on a computer screen while the researchers monitored subject behavior. The experiment found that the method of flashing text and colored boxes on a blank computer screen generally failed to elicit orienting responses among subjects. However, the researchers recognized a weakness in the experiment as being that all the stimuli appeared on a blank screen. Lang et al. (2002) believed that complex environments, or those which more closely mimicked real life, could achieve results that are more significant.

Using the newly adapted limited-capacity information-processing model, Sundar and Kalyanaraman (2004) studied animation speed in advertisements and its effect on the orienting responses of subjects. Sundar and Kalyanaraman believed advertisements featuring high-speed animations would have a higher recognition rate than their low-speed counterparts, thereby facilitating a higher recall rate among subjects. Their study, indeed, showed that subjects exposed to high-speed animated advertisements displayed better retention rates, signaling a greater allocation of resources for processing.

The limited-capacity information-processing model has shown some promise in its application to the Internet. Users seek out information across Web pages and their brains devote the minimum amount of mental resources to the task of encoding and storing any desired information based on the subject's goals or needs. The presence of advertisements distracting the user from the desired information, based on the user's goals or needs, overloads these limited mental resources creating an incomplete encoding of both desired information and advertisements.

H1: Subjects will retain less information from web pages that contain advertisements than from web pages that do not.

Internet Advertising Effectiveness

An Internet advertisement's format is associated with the attitude a subject has toward the advertisement (Burns & Lutz, 2006) and these beliefs can range from indifference to a deep sense of perceived intrusiveness. Furthermore, Edwards, Li, and Lee (2002) found the perceived intrusiveness of an advertisement negatively relates to its effectiveness. The study also found that users would actively take steps to block those forms of advertising perceived to be intrusive (Edwards et al., 2002). Through experimentation, Edwards et al. identified three factors that limit user perceptions of advertisement intrusiveness. These factors include cognitive effort, relevancy of advertisement content to Web page content, and information.

In extending the findings by Edwards et al. (2002), Moore et al. (2005) found that users are more likely to retain information from an advertisement if it utilized

the color palette and content from the Web page itself. In other words, if the advertisement looked as if it belonged on the Web page stylistically and in terms of content, then users would report greater recall rates. For example, if the dominant colors of a Web page were light blue and white, and the content concerned contact lenses, users were more likely to remember an advertisement that was also light blue and white, and advertised contact lenses.

Internet Advertising Effects

The psychology researcher Harlow Gale generally receives the credit for launching the first systematic study of advertising effects in the 1900's (Eighmey & Sar, 2007). Eighmey and Sar describe Gale as, "a path-maker in the application of theory and scientific methods to the study of advertising" (p. 147). While Gale's research focused on print advertising, his contemporaries have applied his theories in the study of radio, television, and the Internet (Eighmey & Sar, 2007).

Regarding Internet advertisement effects, Benway (1999) first described the concept of "banner blindness" to describe a user's tendency to avoid eye contact with anything resembling a banner advertisement. Cho and Cheon (2004) expanded the notion of banner blindness into Internet advertisement avoidance to include other forms of Internet advertising. They state, "When Internet advertisements are a significant source of noise or nuisance, hindering consumer efforts to browse Web content, they can disrupt consumer Web page viewing, distract viewers from the Web page's editorial integrity, and intrude on the viewers search for desired information" (p. 90). They therefore hypothesize that greater perceived goal

impediment would result in greater advertising avoidance on the Internet. To test this hypothesis Cho and Cheon used an online survey, the results of which allowed the researchers to develop a model of Internet advertising avoidance. The Internet advertising avoidance model examines how perceived goal impediment, perceived ad clutter, and prior negative experiences all lead to users to avoid Internet advertising.

The concept of Internet advertising avoidance can be related back to the limited-capacity information-processing model by considering the controlled allocation of resources. Since the advertisements represent a goal impediment, the brain attempts to avoid the advertisement to preserve the allocated mental resources.

More specific research into Internet advertisements' effect on retention, appeared in a study by McCoy, Everard, Polak, and Galletta (2007), in which the researchers experimented on how advertisements interfered with a subject's ability to remember site content. McCoy et al. (2007) conducted an experiment in which subjects received searching tasks to complete on a specially designed web site. Single congruent or non-congruent advertisements appeared on Web pages, which the subject would need to traverse to complete the assigned search task. Subjects then completed a post experimental questionnaire to determine if the advertisements interfered with their retention of the page's content. The researchers found it "clear that advertisements interfere with retention of site content and that features [i.e. amount of congruity between advertisement and

content] of the advertisement also have important effects on retaining both site and advertisement content” (McCoy et al., 2007 p.88).

According to the limited-capacity information-processing model, the brain makes a judgment as to how much mental energy to expend on any given task (Lang, 2000). This judgment is based on the automatic and controlled processes of the brain. Using this reasoning the brain might assign a higher amount of mental resources to advertisements that match page content and thematic elements simply because the brain may not be able to quickly distinguish how the goals or needs of the subject differ from either the content or the advertisements. In other words, since congruous advertisements match the goals or needs of the subject they may be important for later recall. This increase in mental resources would also increase the retention of page content because the increased mental resources negate the negative distraction of the advertisement. In pages featuring non-congruous advertisements, the brain would allocate only the resources necessary to retain the content but not the advertisements, allowing for the distractions they present to result in the incomplete encoding of both content and advertisement.

H2: Subjects will exhibit greater retention of informative content from Web pages with congruous advertisements.

H3: Subjects will exhibit greater retention of advertisements from congruous Web pages.

Method

To address these hypotheses, the researcher conducted an experiment. Prior to the experiment, subjects received a short message detailing the purpose of the study as being the retention accuracy of Web page content, as assessed by a post-experimental questionnaire. Subjects were unaware that the evaluation could also include an assessment of retention ability of advertisements present on their experimental pages. This deception, while minor, was an attempt to focus the attention of the subject on the content, or the true goal to Web page viewing.

Subjects

Subjects consisted of a convenience sample of the students within the College of Liberal Arts at a Northeastern Technical Institute (n=700). Additional subjects were solicited from a convenience sample of students within a Principles of Advertising course and a Mass Communication course (n=60). Email was used to solicit participation from each student within the College of Liberal Arts. The choice to use email solicitation was due in part to the ease at which subjects could access the experiment. However, response may have suffered due to a lower perceived seriousness, as well as the practice of automatically deleting unfamiliar emails.

Dependent Measures

For each of the hypotheses, a post experimental questionnaire allowed the researcher to assess retention of either Web page content, or featured advertisements. Across all three groups, the questions pertaining to the Web

page content remained the same. Additionally, the questionnaire assessing the retention of advertisements used in both experimental groups was also the same. The number of correct responses supplied to each question served as the basis for subject evaluation.

Procedure

Upon receiving clearance to conduct this experiment from the Institutional Review Board, an email cover letter was sent to each individual in the College of Liberal Arts. The subject line of the cover letter read, “Your participation is requested in a Master’s Thesis study,” followed by a body, which contained an introduction, overview, and link to the opening page of the experiment (see Appendix A: Email Cover Letter).

Upon clicking the provided link, the subject’s browser directed the subject to the opening page of the experiment. The opening page contained a consent form explaining the purpose of the experiment and asking if the subject agreed to participate in the experiment (see Appendix B: Consent Form). Provided the subject agreed to participate in the experiment, which was handled by checking the appropriate box in a web form, their browser would direct them to the opening page of the experiment.

The opening page reiterated the purpose of the experiment and required the subject to fill out a pre-experimental questionnaire to determine the username on their university account, their gender, the year in which they were born, and their self-reported level of experience using the Internet (see Appendix C: Opening Page/

Pretest). Upon clicking the “begin” button the experiment engages its set of controls to ensure that the subject is old enough to participate. Provided this case was true, the subject’s browser randomly directed the subject to one of three experiment pages (See Appendix P: Elements of Control).

Each of the three experiment pages featured the same page design and the same content, a story (Palmore, 1989) about lost treasure (See Appendix D: Experiment Content). Additionally, while each page would automatically direct the subject’s browser to the post-experimental questionnaire after the completion of an allotted three-minute time limit. The difference between each of the experiment pages was the presence or absence of advertising and the congruity of the advertising to the story. Subjects in the control group received no advertising (See Appendix E: Control Web Page), while subjects in both experimental groups received advertisements either non-congruous with pages story (See Appendix F: Experiment Web Page (Non-Congruous Advertisements)) or congruous with the pages story (See Appendix G: Experiment Web Page (Congruous Advertisements)).

After the conclusion of a three-minute time limit, which ensured each subject received the same amount of time with which to have access to the experiment page, the subject’s browser automatically directed the subject to the post-experimental questionnaire and blocked the subjects ability to revisit the experiment page. Each of the post-experiment questionnaires contained the same 12 fill-in-the-blank questions concerning the specifics of the story (See Appendix H: Experiment Content Questions; Appendix I: Experiment Content Questions Web Page) and

those subjects participating in the experiment groups received 26 additional fill-in-the-blank questions concerning the advertisements (See Appendix J: Experiment Advertisement Questions; Appendix K: Experiment Advertisement Questions Web Page). After completing the questionnaires, all the subject's browsers redirected to a paged that thanked them for their participation, explained the exact nature of the study and offered them the chance to receive a copy of the research sent to an email address of their choosing (See Appendix L: Experiment Completion Web Page).

Experimental Design

The experiment used to test the hypotheses was a single factor design with three conditions one of which served as a control. A significant amount of planning went into the overall design of the experiment. This design featured two very distinct levels of development to produce not only the experiment the subject would see, but also the subtle manipulation and control that existed beneath each Web page façade.

The visible aspects of the experimental Web page were custom built to mitigate the potential threat of subject familiarity and keep the experience for the subject as authentic as possible. The ultimate goal was to create a Web site that the subject could believe was real. Web sites today use complex graphical structures such as background colors and background images in which to display content. Examples of the best-designed web sites as compiled by McNeil (2008) provided insight into the techniques used to create modern Web pages. These same techniques influenced the creation of the various graphical elements required of the

experiment Web page, including a header with pseudo navigation³, a content area, and a footer (See Appendix M: Experiment Web Page Breakdown).

The advertisements featured on the experiment pages were also custom built but drew upon real world goods and services. To populate the differing sets of experimental conditions it was necessary to create two sets of advertisements. The first set featured goods, services, and designs that were congruous with the content and thematic elements of the story (See Appendix N: Congruous Advertisements). The second group featured goods and services related to their congruous counterparts, but designed to stand apart from the content and thematic elements of the story (See Appendix O: Non-congruous Advertisements). For example, both pop-up advertisements featured magazine subscriptions. The congruous advertisement, however, was for National Geographic and consisted of an image of Egypt. The non-congruous version was for People Magazine and consisted of a drawn beach scene. In addition to drawing from real life examples of advertisements found across the Internet, the research on advertisements by Burns and Lutz (2006), Cho and Cheon (2004), Edwards et al. (2002), Geissler, Zinkhan, and Watson (2006), McCoy et al. (2007), Moore et al. (2005), and Sundar and Kalyanaraman (2004) helped in determining the best strategies employed by advertisers to reach their audiences. For example, the research of Sundar and Kalyanaraman (2004) helped to determine a good ratio of content to animation speed for the animated box advertisement. Additionally, the research done by

3. The pseudo navigation featured apparent links to other pages within the Website, but all linking to those pages was disabled.

Moore et al. (2005) and McCoy et al. (2007) on congruity helped in determining what makes an advertisement congruous and what does not.

Beneath the façade of the Web page, the driving force to the experiment's functionality existed. This driving force utilized PHP Hypertext Preprocessor (PHP), which allows for the creation of dynamic Web pages. By using PHP, Web pages can perform different pre-programmed actions based on the server's evaluation of the PHP code. These pre-programmed actions will always work exactly as the programming dictates completely without bias or emotion. The programming of the page ensured that each time a subject participated in the experiment the same set of controls would manipulate the subject's experiment experience. These elements of control included not only the overall path the subject would ultimately take, but also how the subject's anonymity would be protected and the subject's random assignment to one of the three test groups (See Appendix P: Elements of Control).

Results

Pretest

Prior to administering the experiment to subjects, a convenience sample of nine peers participated in a pretest of the experiment. The purpose of the pretest was to ensure the experimental process was easy to use, that the database and browser functions worked correctly, that the advertisements were effective, and that the allotted time was sufficient to read the story. Pretest participants experienced the experiment as a subject and offered their thoughts concerning improvements to

the process. Suggestions included corrections and alterations to certain questions to make those questions clearer, as well as minor stylistic changes to the web page and content.

Preliminary Findings

One-hundred five subjects (35 per test group) participated in the experiment. Results gathered to catalogue the subjects find an average age of 22, and a gender ratio of 60% female to 40% male. Additionally, subjects self reported themselves as being “experienced” using the Internet on a five point likert type scale (measures of experience were very inexperienced, inexperienced, somewhat experienced, experienced, and very experienced). All additional results contributed in the testing of the hypothesis (See Table 1).

Table 1
Descriptive Statistics for Subjects and Variables

Subjects	No Advertisements Condition	Incongruity Condition	Congruity Condition	Overall
Average Age	21	23	21	22
Gender Ratio (m/f)	13 / 22	15 / 20	14 / 21	42 / 63
Experience Level	4	4.1	3.7	3.93
Number of Subjects (n)	35	35	35	105
Story Retention				
Mean Score	5.43	3.43	3.43	4.1
Standard Deviation	2.44	2.59	2.63	
Advertisement Retention				
Mean Score	–	5.91	6.49	6.2
Standard Deviation	–	5.09	3.81	

Manipulation Check

To ensure the congruity level of each advertisement matched its experiment group placement, each subject within the experimental groups completed a manipulation check, which required the user to gauge the level of relevance each advertisement had to page content on a three point scale (not relevant[1], not sure[2], relevant[3])(See Table 2).

Table 2
Descriptive Statistics for Congruity Manipulation Check

	Incongruity Condition	Congruity Condition
Mean Ad 1	1.47	2.25
Mean Ad 2	1.31	2.31
Mean Ad 3	1.55	2.46
Mean Ad 4	1.6	2.14
Mean Ad 5	1.37	2.09
Mean Ad 6	1.51	2.06
Overall Mean	1.47	2.25
Standard Deviation	.56	.60

Any advertisement receiving a mean score opposite its intended relevancy led to a dismissal of the results garnered by said advertisement. On average, compared to ads in the non-congruent condition, the ads in the congruent condition were recognized to be more relevant to the story in terms of content and thematic elements ($\bar{x} = 2.25$ vs. 1.47, $t_{[68]} = 2.34$, $p < .05$). The t-test result confirmed that the congruity manipulation was successful.

Hypothesis Testing

To test both hypothesis one and two, each subject answered a set of twelve questions concerning the informative content of the Web page. An evaluation of these results yielded a score for each subject based on the number of correctly answered questions. The scores of each test group were then analyzed using an analysis of variance (See Table 3).

Table 3
Analysis of Variance Summary Table

	Sum of Squares	Degrees of Freedom	Mean Squares	F Ratio
Total	759.05			
Between Groups	93.33	2	46.67	7.15*
Within Groups	665.71	102	6.53	

* $p < .01$

Hypothesis 1

The first hypothesis posited that subjects would retain less information from Web pages that contained advertisements than from Web pages that did not. The significant findings garnered by the analysis of variance show only that a difference does exist somewhere between the evaluated groups ($F_{[2,102]} = 7.15, p < .01$). Further analysis using a contrast test while taking into account the homogeneity of variances and Welch procedures did reveal that there was a significant difference in information (story) retention between the control group and the average of the experimental groups ($p < .01$). Specifically, control subjects correctly recalled more information content than subjects in the two experimental conditions combined ($t_{[104]} = 3.782, p < .01$), thus supporting hypothesis 1 (See Table 4).

Table 4
Hypothesis 1 Contrast Test

Test of Homogeneity of Variances (Subject Scores)		
Levene Statistic	Degrees of Freedom 1	Degrees of Freedom 2
0.18 (n.s.)	2	102

Contast Test				
	Value of Contrast	Std. Error	Degrees of Freedom	t Value
Assume Equal Variances	759.05	1.058	102	3.78*

* $p < .01$

Note: n.s.: not significant at the significance level of .05

Hypothesis 2

The second hypothesis posited that subjects would exhibit greater retention of informative content from pages with congruous advertisements. Since the mean informative content score from both experimental groups was the same, a contrast test produced a non-significant result (See Table 5). Thus, Hypothesis 2 is not supported.

Table 5
Hypothesis 2 Contrast Test

	Value of Contrast	Std. Error	Degrees of Freedom	t Value
Assume Equal Variances	0	0.61	102	.00 (n.s.)

Note: n.s.: not significant at the significance level of .05

Hypothesis 3

The final hypothesis posited that subjects would exhibit greater retention of advertisements congruous to Web page content. To test this hypothesis, each subject in the experiment groups received a second questionnaire concerning the content of the advertisements. An evaluation of the answers provided on the second questionnaire yielded a score of correctly identified advertisements based on position. Additional awards of half value points went to subjects who could identify an advertisement, but failed to match that advertisement with its position on the webpage. For example, if the subject recalled the presence of an advertisement for Microsoft Windows 7, but believed its position to be on the right side of the screen, the resulting score would be two points. If the subject correctly identified both the content and the position, the resulting score would be four points. In the event that the subject placed the same response for two or more separate advertisements, only the higher of the two scores entered the record. After scoring each subject response, an analysis of variance was used to evaluate the scores garnered by each test group (See Table 6). While the mean score garnered by the congruous advertisement group was higher than the mean score garnered by the non-congruous advertisement group as was predicted by the hypothesis, the results were not statistically significant ($F_{[1,68]} = .28, p = .60$). Thus, hypothesis 3 is not supported.

Table 6
Hypothesis 3 Analysis of Variance Summary Table

	Sum of Squares	Degrees of Freedom	Mean Squares	F Ratio
Total	1379.22			
Between Groups	5.71	1	5.71	.283 (n.s.)
Within Groups	1373.49	68	20.20	

Note: n.s.: not significant at the significance level of .05

Discussion

This study provides evidence that the presence of advertisements on a Web page negatively influences a user's ability to retain informative content. However, it does not provide any evidence that the level of congruity the advertisement shares with the informative content or thematic design has an effect on a subject's ability to better retain the informative content or even the advertisement.

The first hypothesis, based on the limited-capacity information-processing model, posited that subjects not exposed to Internet advertising would outperform subjects exposed to Internet advertising when tested on Web page content retention. The results gained from the experiment back this assertion. Applying Lang's (2000) limited capacity model to these findings one could conclude that the limited resources allocated by the brain to process and store the content of the Web page are overloaded by the constant pull of the advertisements resulting in an incomplete storage of the content. The model also predicts that the subject exposed to the advertisement would also exhibit incomplete storage of the advertisement as well which we can also see in the results when we compare the overall mean garnered by the advertisement retention score (6.2) against the total achievable score (32).

The second hypothesis, based on Lang's (2000) limited-capacity information-processing model and both the Edwards et al. (2002) and Moore et al. (2005) findings concerning advertisement congruity to content and thematic elements, posited that subjects would exhibit greater content recall on pages featuring advertisements congruent with informative content and thematic elements.

However, both group's content retention scores were the same regarding their mean and median. This hypothesis was posited under the assumption that advertisements with a high congruency to both informative content and thematic elements would result in an increased allocation of mental resources allowing for a more thorough retention of not only the content but also the advertisement. The results, however, suggest that an advertisement has an equally negative effect on information retention despite the level of congruity it shares with the content or thematic elements that make up the Web page.

The third hypothesis, based on Edwards et al. (2002) and Moore et al. (2005), posited that subjects would exhibit greater advertisement recall on pages featuring advertisements congruent with informative content and thematic elements.

While the results do lean in the direction of this hypothesis, the results were not significant ($F_{[1,68]} = .28, p = .60$). It is this researcher's belief that these results speak for the findings of Cho and Cheon (2004) who found that greater perceived goal impediment would result in greater advertising avoidance on the Internet. In other words, subjects saw the advertisements as an impediment, regardless of their congruity, and avoided the advertisements completely. It would seem the mere fact that the box on the right side of the screen is an advertisement, trumps the level of congruity of its content.

In extending this idea, Danaher, Mullarkey, and Essengaier (2006), concluded in their research that experience using the Internet related to a subjects ability to avoid Internet advertising in that the higher a subjects experience, the

greater the ability to avoid Internet advertising. Considering these findings while looking at both the subjects high self-reported experience using the Internet and the low overall scores on advertisement retention suggests that subjects did not perform well because they avoided anything that resembled an advertisement.

Methodological limitations are inherent to all forms of scholarly research. Paramount among these stems from the creation of an artificial situation in which the subject recognizes he or she is participating in a test thereby decreasing external validity. This recognition could skew the results of the experiment as subjects become more observant and cautious than they might normally be. Subjects may have encountered a similar situation in the present experiment. When subjects finished reading the content on the experiment page, they remained stuck until the completion of the three-minute timer. This waiting time, may have served as a reminder for many that they were participating in a test. It is conceivable that the subject may have then returned to the beginning of the page to reread the content, taking special note of the advertisements, thereby adding a skew to the results. However, the need to ensure that all subjects received the same treatment outweighed the ability to add measures for subjects to proceed at their own pace as one would find on an actual Webpage. Within the confines of this methodological need, great care went into minimizing any possible effects associated with the artificial time enforcement. Specifically, tweaks to the time limit were performed following the pretest to best reflect the average time a user required to read the content.

While methodological attempts to limit invalid results began in the early planning stages of the experiment, some issues remained at the experiment's closing, decreasing the internal validity. For example, while the ability for the subject to use the browser's back button was carefully controlled so as not to introduce the ability to review the content, certain browsers could circumvent this measure. However, since these browsers represent fewer than 5% of the current market, it is unlikely that their use skewed the gathered results (W3Counter, 2009).

This experiment is an attempt to contribute to the present understanding of the extent to which the presence of web-based advertising affects one's ability to retain Web page content and advertisements. McCoy et al. (2007) claimed that their research was a, "first step toward a deeper understanding... of [the] ill effects caused by advertising" (p.88). This experiment is an attempt to deepen the understanding sought by McCoy et al. (2007) and further move the study of Internet advertising solely from the realm of effectiveness into the realm of effects. Future research should further explore the effects of Internet advertising as they relate to retention as well as to user frustration and disengagement. Similarly, future research could also benefit from an advertisement effects comparison between young and older individuals. Since the present study focused on college students the age range was very limited. Studying a broader range of ages, or narrowly studying an older age group could reveal differences in how advertisements affect retention ability. Additionally, research into how the content of the advertisement affects a subject's perception of the content could open interesting lines of research.

Conclusion

In this study, the researcher examined the effects of Web-based advertising as it related to a subject's ability to retain information presented on a Web page. Three experimental groups viewed the same informative content and overall page design, but each differed regarding the absence (Control Group) or presence (Experiment Groups 1 and 2) of advertisements and the level of congruity of those advertisements to the thematic design of the Webpage, and the informative content. Through an analysis of the post experimental questionnaire(s) submitted by each subject, the results suggest that while advertisement congruity has no effect on a subject ability to retain informative content, advertisement presence significantly reduces a subject's ability to retain informative content. Additional analysis found that advertisements exhibiting a high congruity to thematic elements and informative content are not significantly easier to recall.

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Appendix A

Email Cover Letter

Subject: Your participation is requested in a Master's Thesis study.

My name is David P. Keppel and I am currently working on obtaining my Master of Science Degree in Communication and Media Technology. As a member of the College of Liberal Arts, you have been selected to participate in a study on Web pages. If you are willing, please click the following link to begin with brief explanation and a short pretest. The total time to participate will only be between 5 and 15 minutes. Thank you for your time.

Sincerely,

David P. Keppel

<http://www.davidpkeppel.com/study/study.php>

Appendix B

Consent Form

Consent Form

The purpose of this study is to examine retention rates of information presented on Web pages. Participation will require you to view a Web page for several minutes and answer some questions about it. The experiment should last no longer than 15 minutes and possibly as little as 7 minutes. Participation is voluntary. Therefore, you may choose not to participate, and may discontinue participation at any time without penalty.

All responses will remain confidential and anonymous by attaching your responses to a unique identification number rather than your name. Your privacy will be protected to the maximum extent allowable by law, and you will not be asked any questions which could be used to personally identify you. The data gathered will be analyzed only in the aggregate so that your name will not be associated with the answers you provide. Your name will not be kept with your responses. On request, and within these restrictions, results may be made available to you.

If you have questions or concerns regarding your rights as a study participant, you may contact - anonymously, if you wish - Heather Foti, Associate Director of the Human Subjects Research Office (HSRO) by phone (585-475-7673), e-mail (hmfsrs@rit.edu), or regular mail (2nd Floor, Bldg 87, Administrative Services Building/Innovation Center, Suite 2400, Rochester, NY 14623-5608).

If you have any questions about this study, please contact the researcher, David P. Keppel (814-558-9359/davidpkeppel@gmail.com) or Dr. Ki-Young Lee (585-475-7732, kxlgpt@rit.edu).

I have carefully read the consent form and would like to participate in this experiment.

I have carefully read the consent form and would NOT like to participate in this experiment.

Appendix C

Opening Page / Pretest

Thank you for your participation!

You will be given four minutes to read the story found on the next page. After the expiration of your four minutes your browser will automatically be directed to a short questionnaire. There is no penalty for not having the correct answer so please do not feel obligated to answer every question. If you do not know the answer, simply leave the space blank. This test is in no way graded and serves no purpose outside of this study.

Please complete the short pretest by answering the required questions below. Please note that your email address will not be tied to your results. When you have completed the pretest you may begin the study by clicking the 'Begin' button at your convenience. Thank you again for your participation.

RIT User Name:
 (example: abc1234)

Gender:
 Male
 Female

Birth Year:
 (example: 1984)

How experienced are you at using the Internet?

Very Inexperienced
 Inexperienced
 Somewhat Experienced
 Experienced
 Very Experienced

Appendix D

Experiment Content

The Red River Treasure

In 1892, Lewis Franklin Palmore was appointed the first federal marshal in Indian Territory, the area that is now Oklahoma. One of his first encounters with criminals occurred two years later. Four men robbed the First National Bank in Bowie, Texas, and headed north, stopping for the night on the south bank of the flooded Red River.

That night Palmore received a telegram from the city marshal of Bowie informing him that the robbers were headed for Indian Territory. Palmore realized that the robbers would have to ford the flooded river at Rock Crossing. The next morning, when the robbers saw that a posse was approaching from the south, they plunged into the river at Rock Crossing and swam beside their horses. Palmore and two deputies waited on the other side and arrested them. In their saddlebags, Palmore found \$18,000 in paper money, which had been divided evenly among them. Surprisingly, \$10,000 in \$20 gold pieces was nowhere to be found.

The robbers were taken to Fort Smith, Arkansas, where Judge Roy Parker conducted a trial and sentenced them to hang. With nooses around their necks, the robbers were seated on their horses, waiting for their execution. One of them leaned toward Palmore and told him that the gold coins had been hidden near the robbers' final campsite, on the south bank of the Red River. Although Palmore searched the area many times for the cache of coins, he never found it. He passed

the story on to his son, Frank, who searched the site before metal detectors became popular.

Frank Palmore believes that to find the coins the treasure tracker must visualize the way the flooded river was in 1894. How high was the water? Where would the riverbanks have been? And where would the robbers have camped? Palmore says that a tracker might get help from local people who remember where Rock Crossing was. The coins will be found, Palmore writes, “somewhere between the bridge on Highway 81 and the mouth of the Little Wichita.”

Appendix E

Control Web Page

Buried Treasure X
[Home](#) [Treasure Stories](#) [Treasure Hunts](#) [Recovered Treasures](#)

The Red River Treasure

In 1892, Lewis Franklin Palmore was appointed the first federal marshal in Indian Territory, the area that is now Oklahoma. One of his first encounters with criminals occurred two years later. Four men robbed the First National Bank in Bowie, Texas, and headed north, stopping for the night on the south bank of the flooded Red River.

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Frank Palmore believes that to find the coins the treasure tracker must visualize the way the flooded river was in 1894. How high was the water? Where would the riverbanks have been? And where would the robbers have camped? Palmore says that a tracker might get help from local people who remember where Rock Crossing was. The coins will be found, Palmore writes, "somewhere between the bridge on Highway 81 and the mouth of the Little Wichita."

I am ready to continue

Appendix F

Experiment Web Page (Non-Congruous Advertisements)

Advertisement

Buried Treasure

PROVISION

Home Treasure Stories Treasure Hunts Recovered Treasures

Advertisement

Introducing Windows 7

Click to Start

LIMITED TIME SUMMER DEAL —
Get up to 8 FREE issues of PEOPLE

People

Save 47% off the cover price!

Advertisement

ERSE

sdays at 8pm/7c

ery

Advertisement

WithUs

south bank of the Red River. Although Palmore searched the area many times for the cache of coins, he never found it. He passed the story on to his son, Frank, who searched the site before metal detectors became popular.

Advertisement

Throughout the world, knowing two to three different languages is fairly common. Would you like to learn a new language, or brush up on one you haven't spoken in a while? If so simply click this advertisement to not only have your pick of instruction in over 150 different languages, but to receive half off your first purchase. The instruction provided by nthlanguage.com is guaranteed to work.

nthlanguage.com

Frank Palmore believes that to find the coins the treasure tracker must visualize the way the flooded river was in 1894. How high was the water? Where would the riverbanks have been? And where would the robbers have camped? Palmore says that a tracker might get help from local people who remember where Rock Crossing was. The coins will be found, Palmore writes, "somewhere between the bridge on Highway 81 and the mouth of the Little Wichita."

I am ready to continue

Continue -->

Appendix G

Experiment Web Page (Congruous Advertisements)

Advertisement

Buried Treasure

Finding the Treasures Others Leave Behind
Swisher Metal Detectors

Home Treasure Stories Treasure Hunts Recovered Treasures

Advertisement

UNITED STATES MINT
THE 2009
DOUBLE EAGLE
GOLD COIN

LEARN MORE
PURCHASE

NATIONAL GEOGRAPHIC

NATIONAL GEOGRAPHIC

THE NEW FACE OF
King Tut
HIS LIFE AND DEATH

12 ISSUES ONLY
US\$15

Advertisement

With Us
Crown Banks

south bank of the Red River. Although Palmore searched the area many times for the cache of coins, he never found it. He passed the story on to his son, Frank, who searched the site before metal detectors became popular.

Advertisement

Fly in style to your next treasure hunting destination with your choice of a major carrier at the lowest possible prices brought to you by dumpsterbargains.com/flights. Unlike other similar services, Dumpster Bargains Flight Department doesn't work for the interests of the airlines meaning you get the lowest prices possible. Stop combing through the trash of other services and come to Dumpster Bargains Flight Department.

www.dumpsterbargains.com/flights

Frank Palmore believes that to find the coins the treasure tracker must visualize the way the flooded river was in 1894. How high was the water? Where would the riverbanks have been? And where would the robbers have camped? Palmore says that a tracker might get help from local people who remember where Rock Crossing was. The coins will be found, Palmore writes, "somewhere between the bridge on Highway 81 and the mouth of the Little Wichita."

I am ready to continue

Continue ->

Appendix H

Experiment Content Questions

Please answer the following questions about the content of the story you just read. If you do not know an answer simply leave the response box blank. When you reach the end, please press the continue button.

1. In what year does the event described in the story occur?
(example: 2009)
2. The federal marshal was appointed to Indian Territory in which present day state?
3. On what river does this article claim the treasure is still located?
4. What was the name of the Federal Marshal? (last name is sufficient)
5. In what state was the bank located which the thieves robbed?
6. How much of the stolen money was recovered by the Federal Marshal?
(example: 100,000)
7. Of what denomination were the gold pieces that have yet to be recovered?
(example: 100,000)
8. To what state were the robbers taken for sentencing?
9. For their crimes the judge sentenced the thieves to what fate?
10. What was the name of the fort where the sentence was carried out?
11. What was unique about the river in that year that a treasure hunter would have to account for?
12. Name one of the two points between which the Federal Marshal believed the money would be found?

Appendix I

Experiment Content Questions Web Page

Please answer the following questions about the content of the story you just read. If you do not know an answer simply leave the response box blank. When you reach the end, please press the continue button.

1. In what year does the event described in the story occur?

(example: 2009)
2. The federal marshal was appointed to Indian Territory in which present day state?
3. On what river does this article claim the treasure is still located?
4. What was the name of the Federal Marshal? (last name is sufficient)
5. In what state was the bank located which the thieves robbed?
6. How much of the stolen money was recovered by the Federal Marshal?
 \$ (example: 100,000)
7. Of what denomination were the gold pieces that have yet to be recovered?
 \$ (example: 100,000)
8. To what state were the robbers taken for sentencing?
9. For their crimes the judge sentenced the thieves to what fate?
10. What was the name of the fort where the sentence was carried out?
11. What was unique about the river in that year that a treasure hunter would have to account for?
12. Name one of the two points between which the Federal Marshal believed the money would be found?

I am ready to continue

Appendix J

Experiment Advertisements Questions

Please answer the following questions about the advertisements featured amongst the story you just read. If you do not know an answer simply leave the response box blank. When you reach the end, please press the continue button.

1. What aspects of advertisement number 1 can you recall if any?

2. How relevant was this advertisement to the story and theme of the Web site?
 Not at all relevant Not Sure Very Relevant
3. What aspects of advertisement number 2 can you recall if any?

4. How relevant was this advertisement to the story and theme of the Web site?
 Not at all relevant Not Sure Very Relevant
5. What aspects of advertisement number 3 can you recall if any?

6. How relevant was this advertisement to the story and theme of the Web site?
 Not at all relevant Not Sure Very Relevant
7. What aspects of advertisement number 4 can you recall if any?

8. How relevant was this advertisement to the story and theme of the Web site?
 Not at all relevant Not Sure Very Relevant
9. What aspects of the inline advertisement (the advertisement that sits within the story) can you recall if any?

10. How relevant was this advertisement to the story and theme of the Web site?
 Not at all relevant Not Sure Very Relevant
11. What aspects of the popup advertisement can you recall if any?

12. How relevant was this advertisement to the story and theme of the Web site?
 Not at all relevant Not Sure Very Relevant

13. Which form of advertising do you feel captured your attention the most?

Header (Advertisement 1)

Skyscraper (Advertisement 2)

Big Box (Advertisement 3)

Tiny Box (Advertisement 4)

Inline (Advertisement 5)

Popup (Advertisement 6)

None of the Advertisements Captured My Attention

14. Why did that form of advertising capture your attention?

15. Do you feel as though you “tune out” advertisements, essentially not noticing them, or do you feel as though you consciously notice all advertisements on a page?

I tune out advertisements

I consciously notice advertisements

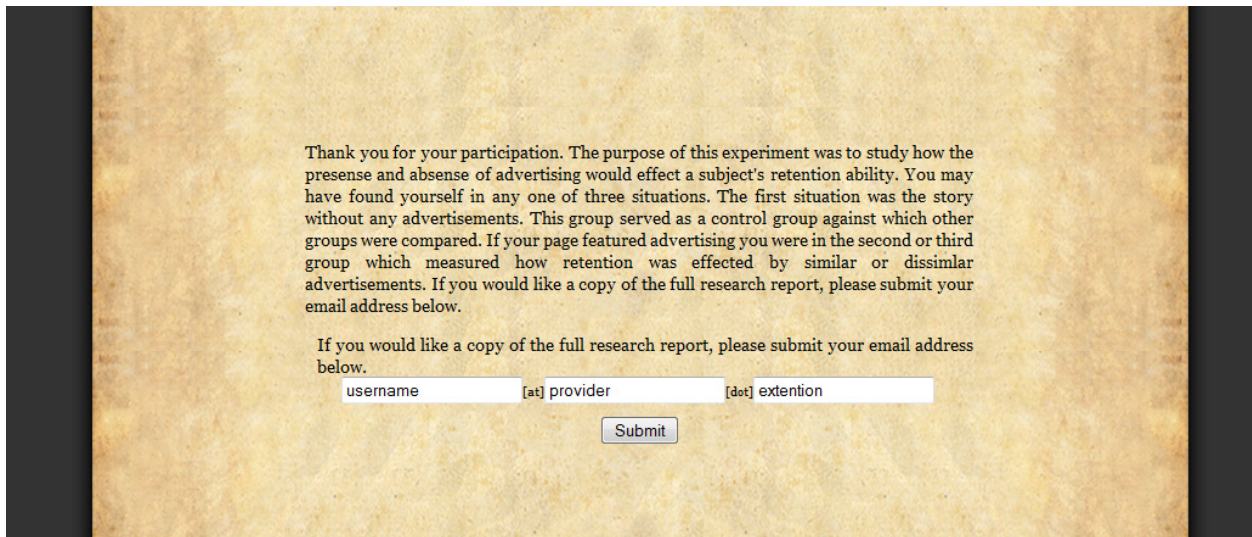
16. Do you generally find advertising to be distracting from your tasks?

I find advertising to be distracting

I do not find advertising to be distracting

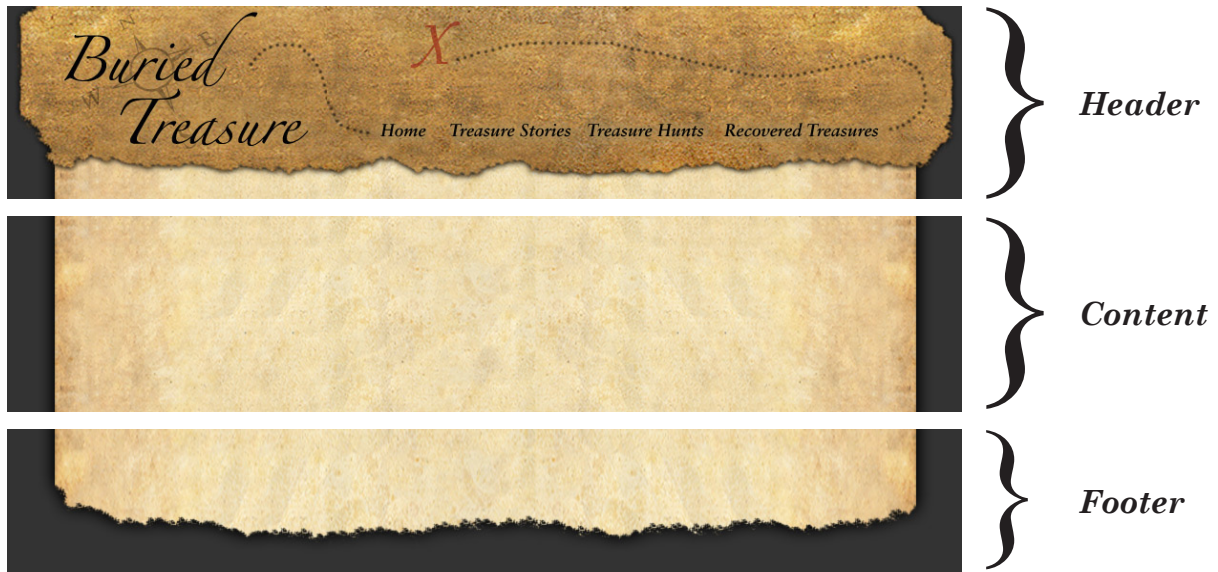
Appendix L

Experiment Completion Web Page



Appendix M

Experiment Web Page Breakdown

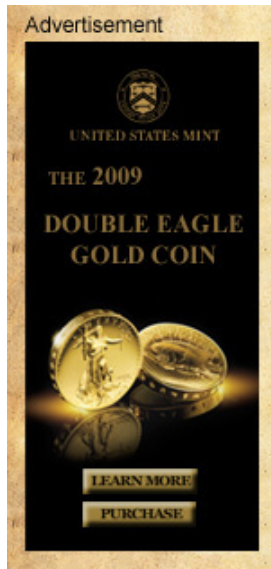


Appendix N

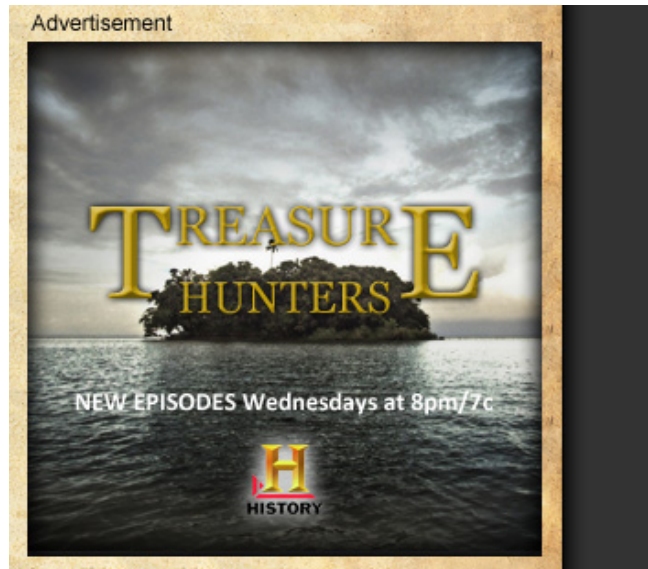
Congruous Advertisements



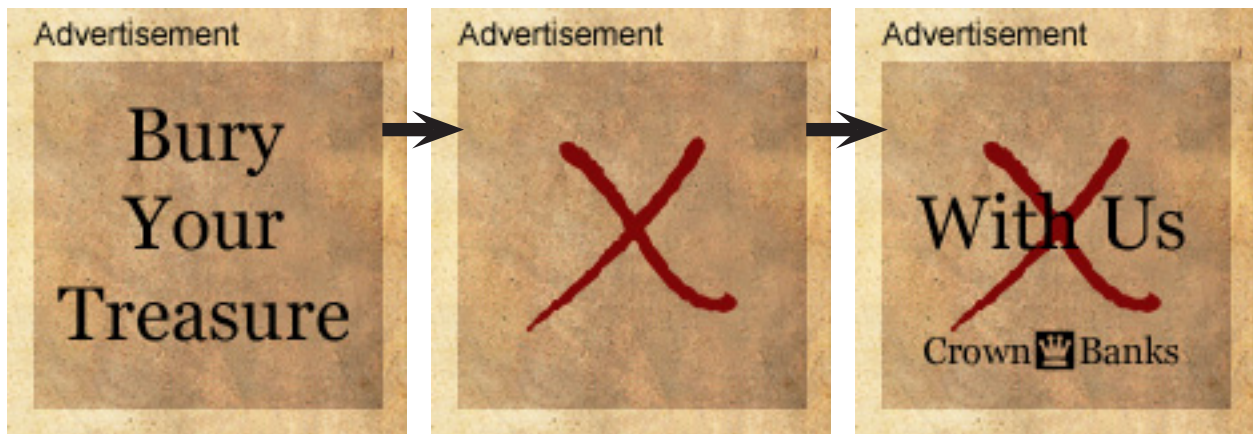
Header Advertisement for Swisher Metal Detectors.



← Skyscraper Advertisement for the 2009 Double Eagle Gold Coin from the United States Mint.



→ Big Box Advertisement for "Treasure Hunters," a new show on the History Channel.



Animated Box Advertisement for Crown Banks.

Advertisement

Fly in style to your next treasure hunting destination with your choice of a major carrier at the lowest possible prices brought to you by dumpsterbargains.com/flights. Unlike other similar services, Dumpster Bargains Flight Department doesn't work for the interests of the airlines meaning you get the lowest prices possible. Stop combing through the trash of other services and come to Dumpster Bargains Flight Department.

www.dumpsterbargains.com/flights

Inline Advertisement for Dumpster Bargain Flights.

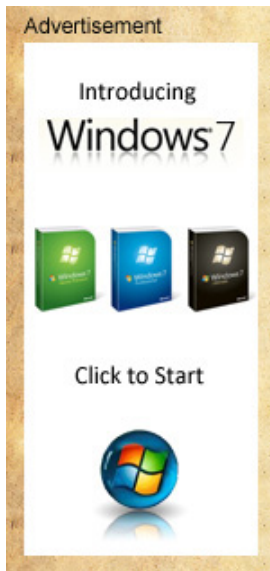
Popup Advertisement for National Geographic Magazine.

Appendix O

Non-congruous Advertisements



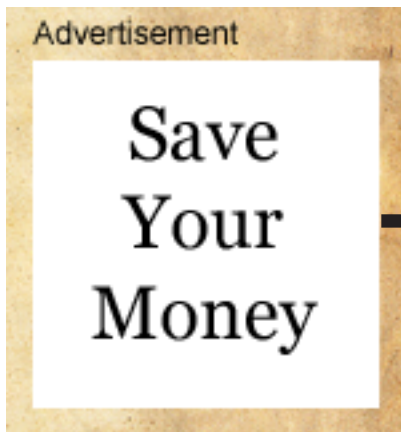
Header Advertisement for Provision Contact Lenses



←
*Skyscraper
Advertisement
for Windows
7 from the
Microsoft
Corporation.*



→
*Big Box
Advertisement for
"The Universe,"
a new show on
the Discovery
Channel.*



Animated Box Advertisement for Crown Banks.

Advertisement

Throughout the world, knowing two to three different languages is fairly common. Would you like to learn a new language, or brush up on one you haven't spoken in a while? If so simply click this advertisement to not only have your pick of instruction in over 150 different languages, but to receive half off your first purchase. The instruction provided by nthlanguage.com is guaranteed to work.

nthlanguage.com

Inline Advertisement for Nth Language.

LIMITED TIME SUMMER DEAL —
Get up to 8 FREE issues of PEOPLE

People

BIKINI BODY AT 48!
How she got there
the best ways
to lose it. It can't
be done!
\$4.99

SEXIEST MAN ALIVE!
HUGO JACKMAN
129
\$4.99

100 MOST BEAUTIFUL
100
\$4.99

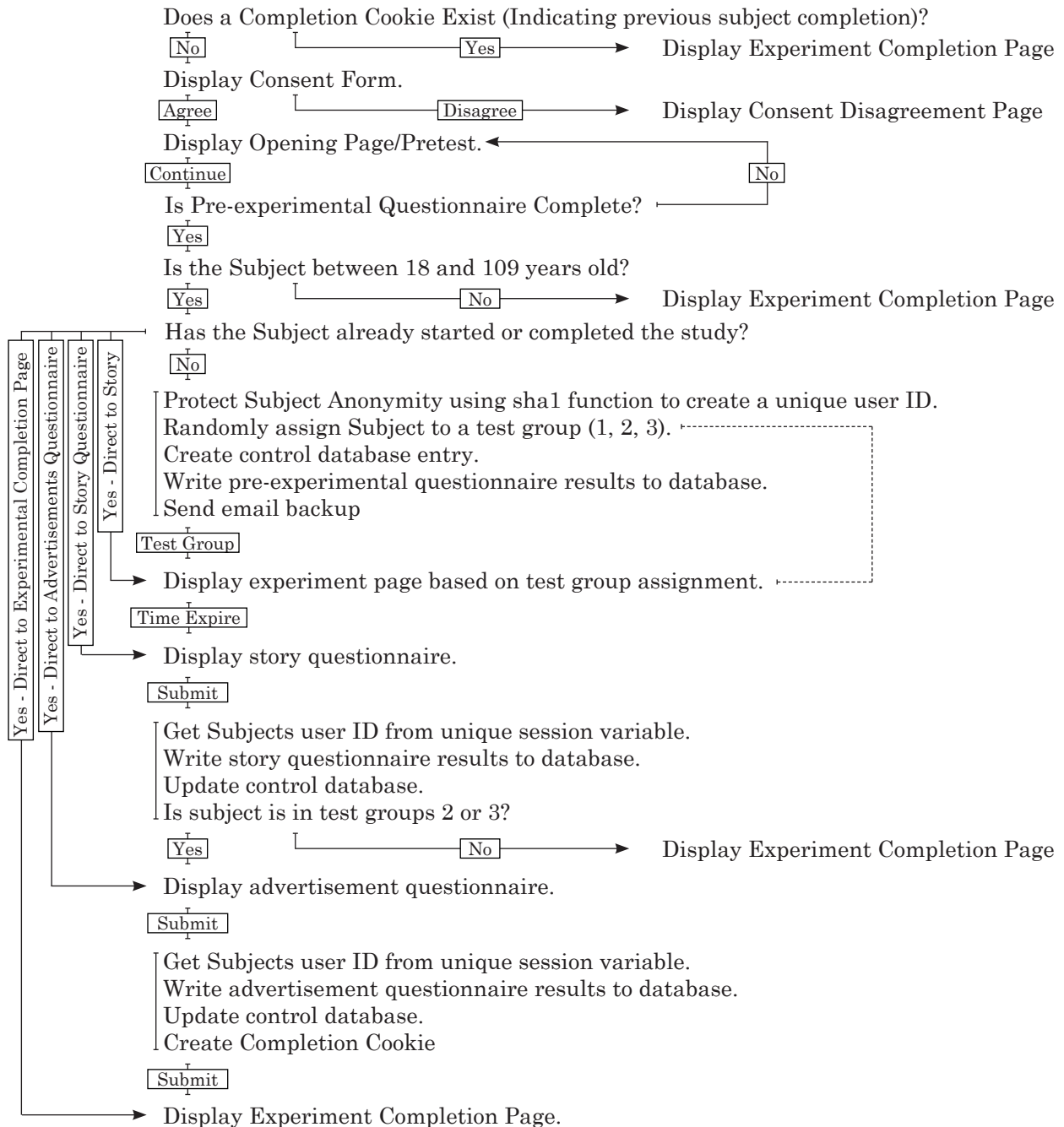
Save 47% off the cover price!

Popup Advertisement for People Magazine.

Appendix P

Elements of Control

Figure 1
The levels of control form a structure.



The levels of control form a structure. These processes, however, relied on the ability of the researcher to connect the responses of a single subject across multiple disconnected database tables. To achieve this task while retaining subject anonymity each subject's university name recorded during the pretest was encrypted using the 'sha1' encryption method. The 'sha1' encryption method worked well in this situation because it cannot be reversed, thereby increasing subject confidentiality. The encryption process turns the university user name into an alphanumeric string. This alphanumeric string could then be stored in each of the subjects database table entries linking them together. An added benefit to this system was the ability of the researcher to easily remove the responses of any subject in the event that they later decided to retract their consent.

The experiment experience also relied on the ability to instantly place any subject in one of three experimental groups at random. This was achieved by utilizing the 'rand' function available in PHP and setting the numbers one, two, and three as the available responses. For each subject the programming of the Web page called the 'rand' function to place that subject in either the control group or one of the two experimental groups. The programming's ability to randomize participation while dividing the subjects evenly between the three groups was tested by running the function in batches (n=1,000,000 and n=500) and tabulating the results (See Figure 2).

Figure 2

Randomizing Participation

Batch Results (n=500)		
Group 1 (Control)	160 Subjects	32%
Group 2 (Experiment 1)	169 Subjects	33.8%
Group 3 (Experiment 2)	171 Subjects	34.2%

Mean = 2.022

Batch Results (n=1,000,000)		
Group 1 (Control)	333,290 Subjects	33.329%
Group 2 (Experiment 1)	333,427 Subjects	33.343%
Group 3 (Experiment 2)	333,283 Subjects	33.328%

Mean = 1.999993