

**A Study of the Effects of Online Advertising:
A Focus on Pop-Up and In-Line Ads**

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September 9, 2004

Acknowledgements: The authors would like to thank Miguel Olivas-Luján and John Wells for assisting with data collection in Mexico and the US, respectively. The authors also appreciate the helpful comments from the attendees of the Batten research workshop at the College of William and Mary.

This study was funded in part by a grant from the International Business Center, University of Pittsburgh, Katz Graduate School of Business.

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Abstract

Web advertising has taken many forms, including those that appear within the Web page as an inline graphic, as well as those that "pop up" (over) or "pop under" a browsing window. Grounded in the concepts of perceived intrusiveness and the dual-process theory of cognition and perception, research provides theory-based expectations about how users come to view these ads as irritating and intrusive and thus avoid them. There have been few studies of the affective, cognitive, and behavioral impacts of such advertisements. This study also examines factors that can explain the hypothesized outcomes, in a 2x2x2 fully-factorial design. Besides a control group without ads, factors included ad placement (pop-up versus inline) and ad congruence (with the site's content or not). 417 volunteer undergraduate business students from two countries (Mexico and the United States) performed several search tasks under conditions chosen for them at random. Results indicated that, as expected, intention to return was higher without ads than with ads; retention of website information was higher when ads were not congruent (rather than congruent) with website content, and for sites with inline (rather than pop-up) ads; retention of ad content was higher for non-congruent (rather than congruent) ads, and for inline (rather than pop-up) ads. In contrast, intentions to return were not affected by ad placement, retention of site content was not affected by the existence of ads, retention of animated ads did not surpass that of static ads, and intrusiveness of ads was not affected by the ad congruence, as had been expected. This study provides an initial step into examining several important factors that should be considered by advertisers and designers of sites hosting those ads.

Keywords: electronic commerce, advertising, web site design, intentions, retention

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Introduction

Several online marketing delivery techniques exist, such as banners, in-line ads, interstitials, pop-up ads, and pop-under ads, and methods of taking advantage of these different promotional techniques have been investigated (e.g., Gao, et al., 2004). Some studies have reported that consumers despise these intrusive and annoying advertisements and even feel “violated” and “molested” by their presence (Wegert, 2002). Other studies have documented consumers’ experiences with various internet advertising techniques (e.g., Gao et al., 2004).

Problem Statement

In traditional media, intrusiveness has been recognized as a leading cause of advertising annoyance (Bauer & Greyser, 1968). Although Rust and Varki (1999) predicted that advertisements in new media would be less intrusive, Li, Edwards and Lee (2002) report that online consumers are goal-oriented and perceive online advertisements to be even more intrusive than those in other media. Further, they found that online consumers develop negative attitudes towards the advertisements which then lead them to develop intentions to not return to the site. The purpose of this research is threefold. First, we examine the effects of online advertising in general. Second, we investigate whether the particular type of ad affects consumers’ retention levels of the website content, the ad content and consumers’ perceived intrusiveness of the ad. Finally, we look at whether the congruency of the ad content (with the hosting site) affects these same variables.

Research Questions

Stated more formally, the research questions that this paper addresses include the following:

1. Does online advertising affect users' intentions to revisit websites or retention of website content?
2. Does the type of ad (in-line vs. pop-up, or animated vs. static) differ in its effects on retention of website content, retention of ad content, or perceived intrusiveness of the ad?
3. Does the congruency of the ad affect: retention of website content, retention of ad content, or perceived intrusiveness of the ad?

The remainder of the paper will proceed as follows: the next section will report on prior research that has been conducted on the subject, which will lead to the development of hypotheses. Section 4 describes the research methodology and experimental design used to test the hypotheses as well as the data collection procedure. Section 5 details the analysis conducted and reports the results. Discussion of the results and conclusions drawn from the research are set out in the following section. The final section outlines limitations of this research and proposes potential future research streams that will extend this present research study.

Background

Internet advertising is expected to reach \$9.1 billion this year in the U.S., according to eMarketer, representing an increase of \$1 billion over a previous high in 2000, at the peak of the dot-com boom. The more recent emergent recovery provides optimism for marketers, as a study (Interactive Advertising Bureau, 2004) reports fourth quarter 2003 increases of 38% over the

previous year and overall increase from 2002 to 2003 of 21%. Forrester and Jupiter research reports predict increases this year of 20% and 27%, respectively, over 2003. So far, the actual numbers are the most optimistic of all, as 2004 figures appear to be 38.9% over the same period in 2003 (IAB and PricewaterhouseCoopers). Such massive figures make it clear that firms need to closely monitor the impacts of their advertising techniques.

Early research on banner ads found them to be effective in creating brand awareness and positive attitudes (Briggs & Hollis, 1997). Since then, internet advertising has been described as nonsensical, uninformative, unfocused, forgettable, and ineffective (Bulik, 2000). A survey conducted by Jupiter Research in 1999 found that 69% of those surveyed consider pop-up ads annoying and 23% of the same sample said they would not return to the site because of the ads.

Theoretical Basis in E-Commerce

The attitude-toward-the-ad theory based in marketing communications and advertising research is one of the most dominant in the field (e.g., Bruner & Kumar, 2000). Studies have examined attitudes of consumers towards online advertising, consumer behavior and perceptions in the online environment. Although Eighmey (1997) reported that users find information helpful when it is presented in an enjoyable context, many of these studies report that consumers develop such negative attitudes towards the ads that they avoid them when possible. In theory, these negative attitudes affect brand perceptions (Mackenzie & Lutz, 1989) which can also lead to ad avoidance (Abernethy, 1991; Krugman & Johnson, 1991).

Some researchers expected advertisements in new media to be less intrusive (Rust & Varki, 1996) or even entertaining (Coyle & Thomson, 2002), but Reed (1999) found that on-line ads are disturbing. Tactics such as pop-up ads relegate users to being viewers of passive mes-

sages (as with television commercials). Research on traditional media has shown that when consumers are given a means to avoid ads, many do; they leave the room, change the channel (Abernethy, 1991), participate in another activity or ignore the ads altogether and focus on something else (Krugman & Johnson, 1991).

This sense of irritation is a factor that has been studied extensively in traditional media (Greyser, 1973) and can be caused by tactics that consumers perceive as annoying, offensive, or insulting. In addition, the interruption that is created by banners, pop-ups, pop-unders and other forms of advertising was found to negatively affect consumers' attitudes towards the ads (Rettie, 2001). In-line ads may to some extent blend into the web pages on which they are displayed, while pop-up ads, on the other hand, are designed to interrupt; the interruption itself might be enough to explain their intrusiveness.

Theoretical Basis in Psychology Research

Perhaps the intrusiveness can be also explained by cognitive psychological models of attention and attendant effort that is required to process additional information. The need for additional effort can readily account for performance and affective differences. That is, irritation can result from exposure to more stimuli that do not contribute to the task at hand. Perhaps even more interesting and important is the role of congruence of the content of the additional information.

So-called "dual process theories" (e.g., Smith & DeCoster, 2000) in Cognitive Psychology suggest that a person recognizes and internalizes general regularities with one process, but requires a second, more conscious and effortful process to form representations of unique or novel events. In this study, uniqueness and novelty are applied on three levels: to the event of an

advertisement itself, to the event of the advertisement popping up in a separate window, and to the congruence of the content of the advertisement to the rest of the site.

Dual-process models have been applied to a variety of situations, including learning and memory (e.g., Smith & DeCoster, 2000), suppression of interfering stimuli (e.g., Goldfinger et al., 2003), emotion (e.g., Teasdale, 1999), persuasion (e.g., Chen & Chaiken, 1999), and person perception (e.g., Brewer, 1988; Fisk & Neuberg, 1988; Hastie & Kumar, 1979). These situations are all related through the sometimes purposeful, sometimes unconscious management of effort.

The dual processes differ most acutely in the foundational research of Hastie and Kumar (1979), where the outcomes of being exposed to congruent and incongruent information differ depending on the situation. In general, we often process information about another person quite superficially, expending just enough effort to guide our behaviors toward the individual. However, if we are told that the other person will be motivationally relevant to us, we will raise the amount of effort we expend in processing information about them (Smith & DeCoster, 2000). For example, when we encounter a very young grocery store clerk, we might only attend to information that is consistent with our initial impressions (perhaps based on a stereotype about teenagers), and reject information that is inconsistent with that stereotype. However, if we are told that this teenager is dating one of our children, we might pay very close attention to all information, both consistent and inconsistent with our impressions.

Applying a dual process theory of person perception to web advertising is the task of this study. While there are fewer opportunities to form stereotypical caricatures of a website as we do of people, we do formulate impressions of a site (Everard, 2003), and we become involved with sites to varying degrees, from brief and superficial to highly-involved and relevant. In applying the dual process model to web advertising, we assume that when a web search task leading to an

important goal is performed, a person will find the task motivationally relevant, even if for a brief period of time.

Based on the prior research presented here, the following sections develop the hypotheses to be empirically tested.

Behavioral Intentions

From the standpoint of web advertising research, on-line consumers are goal-oriented and perceive ads to be even more intrusive than when they are viewed in other media (Li et al. 2002). Consumers' negative attitudes can affect brand perceptions and attitudes (MacKenzie & Lutz, 1989) and can lead to ad avoidance (Abernethy, 1991; Krugman & Johnson, 1991). A dual-process theory would explain this expectation by predicting that users will prefer to avoid more effort-intensive processing caused by additional, peripheral information (Smith & DeCoster, 2000). This leads to our first hypothesis.

H1. The presence of Advertisements (of any kind) on a Website will result in weaker intentions to revisit the site than websites without advertisements.

Results of recent research (Chan, Dodd & Stevens, 2004) on attitudes and opinions about pop-ups in advertising indicate a “strong and intense dislike for pop-up ads, resulting in a negative attitude towards the website itself and the brand owner” (p. 2).

In one study, banner ads were better received than pop-ups, and users felt better about companies using banner ads than pop-ups (Denes, 2001). Interference was an explanation; 84% of respondents stated pop-up ads interfere with their reading or using a Web page, while only 54% said banner ads interfere with their Web usage. In-line ads are very similar to banner ads on

the interference dimension.

Again, a dual-process model would explain this expectation by focusing on the additional effort imposed by pop-up advertisements (Smith & DeCoster, 2000), which are peripheral to users' main tasks. Therefore, we hypothesize:

H2. Behavioral Intentions will be more positive when Advertisements are provided in-line compared to when they are imposed in a Pop-Up format.

Retention of Website Content

An important goal of website designers is that users will retain the content to promote subsequent visits and/or referrals to other potential visitors. Ads compete for attention and raise cognitive effort, whether reading or avoiding them, interfering with use of the site and reducing the likelihood of retaining the site's content. The more mental energy extended to non-website material, the less retention of website content can be expected. This leads to the following:

H3. User retention of website material will be higher for sites without ads than for sites with ads.

Research has shown that interruptions have a negative impact on emotion and well-being, and lead to increases in effort expenditures (Zijlstra, Leonara & Krediet, 1999). Although any advertisement can be classified as an interruption, one that requires a user action to remove it, like a pop-up ad, will cause an increased expenditure of effort (Chan et al., 2004), reducing retention of website content. Because an in-line ad requires less interruption and mental energy than a pop-up ad, we expect higher website retention levels in those subjects receiving in-line ads as compared to pop-up ads. This leads to Hypothesis 4:

H4. User retention of website material (when Ads are present) will be higher for sites with in-line ads than for sites with pop-up ads.

It is important to recapitulate the assumption of motivational relevance described above. The person-perception results of Hastie and Kumar (1979) imply that if a site is perceived to lead to an important goal, retention is more likely to occur when advertising material is not congruent with that of the rest of the site than when it is congruent. Interestingly, if the site does not lead to an important goal, retention is more likely when encountering non-congruent material. As described below, in this study we do not address momentary or otherwise superficial browsing, and therefore, hypothesize that non-congruence will be more memorable. In such a study, the researchers' burden will include formulating an experiment that contains this relevance.

The hypothesis is more formally stated as follows:

H5. User retention of website material (when Ads are present) will be higher when Ads are non-congruent than when Ads are congruent.

Retention of Ad Content

Common sense tells us that ads that are most visible will be remembered. However, deeper consideration of web advertising reveals that while pop-up ads are more interruptive than in-line ads, requiring a user to act to remove them, they appear on the screen for a shorter time period because users tend to close them immediately.

Many users say that they only focus on the "x" in the upper-right corner of the window (Chan et al., 2004), as they close them immediately. Because of that commonly-found behavior pattern, the ads will appear for only a brief period of time. In-line ads remain visible for a much longer period, and users are thus more likely to see them in their peripheral vision. It is expected

that this longer time will increase user retention of the ad content. More formally stated,

H6. User retention of web advertisement content will be higher with in-line ads than pop-up ads.

Following the same logic as the site content hypotheses, user retention of advertisement content is expected to be higher when ads are not congruent with the product content, again assuming that the task is motivationally relevant to users. That is, people will attend to the ads more, trying to reconcile them with the content in some way.

Research has shown that users were particularly irritated by pop-up ads that were not related to the site (Chan et al., 2004). We consider the irritation and anger to represent more attention (i.e., cognitive processing) by the user, and thus, ads that irritate users further increase the likelihood that non-congruent ads will be more memorable. Therefore:

H7. User retention of web advertisement content will be higher when ads are not congruent than when ads are congruent with content in the rest of the site.

Recent research (Hong, et al., 2004; Zhang, 2000;) supports the notion that an animated ad will compete more for visual attention than a static ad. With this added required attention, it is expected that the content will be more easily remembered. More formally stated,

H8. User retention of web advertisement content will be higher with animated ads than with static ads.

Perceived Intrusiveness of Ad

Ads that interfere with consumers' primary tasks will lead to more intrusiveness. These negative feelings can be exacerbated by the degree to which these ads are disturbing (Li et al.,

2002). Users are particularly frustrated by ads that obstruct information, like pop-up ads, because they are an unwanted interruption (Chan et al., 2004) and require more attention and effort. Users feel imposed upon because they have no choice but to act in order to remove the advertisement (Benitez, 2002); because pop-up ads require user action to remove, they will be perceived as more intrusive. This leads us to the following hypothesis.

H9. Pop-up ads will be perceived as more intrusive than in-line ads.

However, not all ads are viewed with the same level of intrusiveness. Some researchers (Lee & Lumpkin, 1992) found that ad avoidance is moderated by the degree to which people view ads as containing useful information. Ads that contain information perceived as useful elicit less irritation and are less likely to be avoided (Pasadeos, 1990). Users are particularly irritated by ads that are not related to the site, as they perceive no real or useful reason for ads to be there (Chan et al., 2004).

Such an expectation might seem on the surface to fly in the face of previous hypotheses about recall and motivational relevance. However, a closer review will reveal that while the additional effort required will lead to more effective recall of non-congruent information, this effort represents an undesirable increased cost of browsing the site, leading to our final hypothesis.

H10. Website ads that are congruent with site content will be perceived as less intrusive than ads that are not congruent with site content.

Research Methodology

The study was conducted in an experimental setting to control precisely the location and size of the advertisements, as well as to allow measurement of outcome variables. In general, a

2x2x2 factorial design was employed, where the factors included ad placement (pop-up or in-line), congruence, and animation. In addition, an exploratory pop-under treatment was also created for comparing results of pop-up and pop-under ads.

Operationalization of Variables

An artificial website was created for the experiment similar to the one used in previous research (Galletta, et al 2003). This site contained images, prices, and descriptions of familiar products and product categories. The products were those that would be carried by a “general store,” and included food, health care, and household products.

Four sets of six original ads and slogans were created. Existing ads and slogans were avoided to prevent prior experience from contaminating our results. All were presented either in a separate window (pop-up) or presented within the page presented to users (in-line). Two of the four sets of ads were congruent and the other two were non-congruent. Two were animated and two were static. That is, all combinations of all ads were created in the fully-factorial design.

Advertisement Types

Advertisements, the central factor in this study, were inserted with Javascript code to provide identical placement in all treatments. One ad was placed on each of 12 strategically-chosen pages (about 10% of the 121 pages in the site). Each of those pages was on a path users would follow to reach the goals of most of the search tasks provided to participants. Only one ad was placed along the path for each of the selected tasks, to minimize interference *within* advertisements. We wanted to focus on the interference of ads with the *content*, not on the interference of ads with *each other*.

Animated/Static

A set of animated and static advertisements were created. The ads were exactly the same, except that elements of the animated advertisements were designed to move, resembling a short video rather than a static ad. Animated gifs were created for the animated ads.

Congruency

Congruent ads were displayed during the appropriate search task to appear logical (i.e., congruent) with each task. A non-congruent ad featured an advertised product that had no relationship to the product in the search task. Furthermore, the products themselves were considered less likely to be found in a “general store” at all, although this distinction was more difficult to operationalize and enforce. Examples of congruent ads included such products as Land O Lakes Butter, Jet Dry rinsing agent, and Charmin bath tissue, while examples of non-congruent ads included Prudential Insurance, Jaguar automobiles, and Lay-Z-Boy furniture.

Placement

All ads appeared in the same place on the page, toward the right side as found in many high-traffic sites. No text was obscured when a page contained an ad, in the conventional style of in-line ads. In practice, many pop-up ads do obscure text, but we chose to control placement precisely and vary only the existence of the separate window of a pop-up ad.

Dependent Variables**Behavioral Intentions**

Behavioral intentions were measured using the total of four questions that focus on two related future behaviors: how readily the subject would visit the site again and how likely he or

she would recommend that others visit the site (7-point scales) (Alpha = .94).

Intrusiveness of the Ad

Intrusiveness of the Ad was measured using a 7-item subscale of a larger instrument by Li et al. (2002). The items were in the format of a 7-point Likert scale, asking respondents to indicate how much they agreed with statements that indicated how they felt about the ads. The terms used were “distracting,” “disturbing,” “forced,” “interfering,” “intrusive,” “invasive,” and “obtrusive” (Alpha = .96).

Retention

Retention was measured by asking participants to demonstrate what they remembered from the site from the 9 tasks they performed, and from the 6 ads they saw. True/false and multiple choice questions were used because respondents were not asked to memorize anything, and we wished to avoid situations in which a person might only partially recall the answer. By making use of recognition rather than recall, we eliminated the need to make judgments about “partial credit” when answers were close but not exactly correct.

Site Retention: Factual issues collected from the 9 tasks were used, and the score was the total number of facts retained. For ad retention, 18 true/false items were used. Six congruent, six non-congruent, and six other brands were presented, and subjects were asked to check each one seen. The total site retention score varied from 0 to 9, reflecting how many items participants could recall.

Ad Retention: Because different ads were provided to subjects in the congruent-ad treatment compared to the non-congruent-ad treatment, we included both sets of ads in the retention task. In addition, six more distracters served as a common baseline for each task. Therefore, there were 18 items in the ad retention measure.

To prevent respondents from achieving a perfect score by answering “yes” to all product and brand items, participants received a point for remembering each product they did see, and one point for not remembering each product they did not see. The total ad retention score varied from 0 to 18, reflecting the number of ads correctly identified as being either contained in, or not contained in, the site.

Subjects

Undergraduate students enrolled in two U.S. universities and one Mexican university were invited to participate in the study. 417 volunteer undergraduate business students performed several search tasks under conditions chosen for them at random. Subjects were given the opportunity to participate during one of their class periods, and an incentive was offered to stimulate interest in, and completion of the task. Nearly 100% of the students who were invited participated in the study. In the U.S., instructors provided extra credit points to those who completed the entire task. In Mexico, we discovered that instructors could not assign such extra credit, and instead needed to provide a random drawing for a \$100 (US) cash prize each day. All participants who completed the entire task were eligible to win.

Procedure

The experimental websites were accessed over the Internet. A computer laboratory containing identically-sized XGA screens (1024 x 768) further controlled the subjects' environments. Subjects were assigned to treatments via the use of a code, and asked to sit in front of a computer where they found the code sheet. One of the authors (or an assistant) entered the correct code for greater accuracy in assigning subjects to treatments. An experimenter gave introductory comments and directions to the participants.

The experimental task consisted of searching for information on nine familiar products contained in a website simulating a “general store” environment. After browsing the site, subjects placed answers to the nine search tasks on the code sheet provided. Once the subjects completed all of the search tasks, they were directed to close all open windows then raise their hands to receive further instructions. An experimenter made sure they closed all windows to ensure exposure to the exploratory pop-under category, then opened a new browser window and navigated to the survey. Given that the survey also contained questions that measured recall, the experimenter also collected the paper containing the answers from each subject. After completion of the survey, a “thank you” window appeared and each participant was free to leave.

Results

Data were coded and hypotheses were tested using SPSS version 12. Tests of each hypothesis will be reviewed below, along with the results.

H1 predicted that behavioral intentions would be more positive for subjects who were not exposed to advertisements of any kind. This hypothesis was supported (See Table 1). All other factors being equal, (controlling for all other effects), subjects who were not exposed to ads were more likely to return or recommend the site to others.

Table 1: Behavioral Intentions With and Without Advertising

	With Ads (N=417)	Without Ads (N=119)	Results (one-tailed)
Behavioral Intentions	12.96	14.45	T=2.35; 534 df; p<.009

H2 predicted that behavioral intentions would be more positive for participants who were exposed to in-line ads as compared to those who were subjected to pop-up ads. H2 is not supported. Table 2 shows that it appears that advertisements of any kind, regardless of mode, affect

behavioral intentions.

Table 2: Behavioral Intentions with In-line versus Pop-Up Ads

	In-line Ads (N=129)	Pop-up Ads (N=151)	Results (one-tailed)
Behavioral Intentions	13.31	12.72	T=-.808; 278 df; NS

H3 predicted that retention of site content would be higher without ads than with ads. Table 3 provides the results, also non-significant.

**Table 3: Site Retention with and Without Advertising
(perfect score=9)**

	With Ads (N=417)	Without Ads (N=119)	Results (one-tailed)
Retention of Site Content	7.76	7.83	T=.703; 534 df; NS

According to H4, retention of website material was expected to be higher for participants who were exposed to in-line ads than for those exposed to pop-up ads. Table 4 shows support for H4. Subjects exposed to in-line ads remembered about 3.4% more of the material in the site than those exposed to pop-up ads.

**Table 4: Site Retention with In-line versus Pop-Up Ads
(perfect score=9)**

	In-line Ads (N=129)	Pop-up Ads (N=151)	Results (one-tailed)
Retention of Site Content	7.92	7.66	T=-2.027; 278 df; p<.022

H5 predicted that retention of website material was expected to be higher for subjects exposed to non-congruent advertisements material than for those exposed to congruent ads. The test reported in Table 5 supported that prediction, and showed that those exposed to non-congruent ads remembered about 3.5% more of the website material than those exposed to congruent ads.

Table 5: Site Retention with Congruent versus Non-Congruent Ads (note: an unequal variance model was used) (perfect score=9)

	Congruent Ads (N=216)	Non-Congruent Ads (N=201)	Results (one-tailed)
Retention of Site Content	7.63	7.90	T=2.61; 413.2 df; p<.005

H6 addresses retention of ad content, and predicted that retention of advertisement content would be higher for in-line ads than for pop-up ads. Indeed, ad retention was significantly higher for in-line ads (see Table 6).

Table 6: Ad Retention with In-line versus Pop-Up Ads (note: an unequal variance model was used) (perfect score=18)

	In-line Ads (N=129)	Pop-up Ads (N=151)	Results (one-tailed)
Retention of Ad Content	11.46	11.10	T=-2.293; 265.6 df; p<.012

H7 also concerns retention of advertisement content, and predicted that such retention would be higher for participants who were exposed to ads that were not congruent with website content than for those who were exposed to congruent ads. Table 7 supports this hypothesis, favoring non-congruent over congruent ads.

Table 7: Ad Retention with Congruent versus Non-Congruent Ads (note: an unequal variance model was used) (perfect score=18)

	Congruent Ads (N=216)	Non-Congruent Ads (N=201)	Results (one-tailed)
Retention of Ad Content	11.08	11.36	T=2.08; 415.2 df; p<.019

In H8, the expectation is that ad retention is higher with animated ads than with static ads. Table 8 displays the unexpected result; the difference is not significant.

**Table 8: Ad Retention with Animated versus Static Ads
(perfect score=18)**

	Animated Ads (N=191)	Static Ads (N=226)	Results
Retention of Ad Content	11.26	11.18	T=-.563; 415 d.f.; NS

H9 asserts that pop-up ads are more intrusive than in-line ads. Table 9 shows that, as expected, pop-up ads are significantly more intrusive than in-line ads.

Table 9: Intrusiveness of In-line versus Pop-Up Ads (note: an unequal variance model was used)

	In-line Ads (N=129)	Pop-up Ads (N=151)	Results (one-tailed)
Intrusiveness of Ads	21.06	26.13	T=3.478; 277.96 df; p<.001

Finally, H10 posits that ads that are not congruent with site content are more intrusive than ads that are congruent with site content. As Table 10 illustrates, the means are not significantly different.

Table 10: Intrusiveness of Congruent versus Non-Congruent Ads

	Congruent Ads (N=216)	Non-Congruent Ads (N=201)	Results (one-tailed)
Intrusiveness of Ads	24.94	25.46	T=.421; 415 df; NS

Discussion

Table 11 reviews all hypotheses, expected results, and actual results. Clear support is provided for an assertion that users will adopt more negative behaviors when a site displays advertisements than when the site does not.

Table 11: Review of Results

Construct	Expectation	Result
H1: Behavioral Intentions	With Ads < Without Ads	Supported
H2: Behavioral Intentions	In-line > Pop-up	NS
H3: Retention of Site Content	With Ads < Without Ads	NS
H4: Retention of Site Content	In-line > Pop-up	Supported
H5: Retention of Site Content	Non-congruent > Congruent	Supported
H6: Retention of Ad Content	In-line > Pop-up	Supported
H7: Retention of Ad Content	Non-congruent > Congruent	Supported
H8: Retention of Ad Content	Animated > Static	NS
H9: Intrusiveness of Ads	Pop-up > In-line	Supported
H10: Intrusiveness of Ads	Congruent < Non-Congruent	NS

It is clear that advertisements do seem to interfere with retention of site content, and features of advertisements also have important effects on retaining both site and ad content. In-line ads permit both site and ad content to be remembered more clearly than pop-up ads, which is most interesting because it suggests that the action of closing the advertisement window distracts users from the site, and further, it is visible for a shorter time. When ads are markedly different from the content of the site, they theoretically stimulate more effort as users work toward an important goal, and users remember more about both the website and the advertisement. It is interesting to note that these effects are simultaneously rather small and consistent.

Finally, it is also clear that pop-up ads are considered to be more intrusive than in-line ads. Users seem to prefer not to be interrupted from their searching task, diverting their attention towards closing the pop-up windows containing the ads.

Exploratory Analysis

Besides pop-up ads, we also created identical ads that “popped under” the current window for making comparisons against the pop-up ads. Pop-under ads were indistinguishable from

pop-up ads on every dependent variable. It is perhaps worth mentioning that intrusiveness of pop-under ads was reported to be 33.1% higher than the intrusiveness of in-line ads ($t=4.728$; 264 d.f.; $p=.000$), while the intrusiveness of pop-up ads was only 24.1% higher than the intrusiveness of in-line ads ($t=3.478$; 277.96 d.f.; $p<.001$). However, because the intrusiveness of pop-up and pop-under ads were not significantly different, we were unable to draw a direct conclusion that pop-under ads are more intrusive than pop-up ads.

Another exploratory analysis involves cross-cultural issues about advertising. Most e-business studies involve participants from a single culture. We chose to examine web advertising in two countries, and the numbers presented above include the entire pool of subjects from both countries.

Table 12 shows the overall means on the four major dependent variables in this study, namely, behavioral intentions, retention of site content, retention of ad content, and intrusiveness of the ads. Comparison of the means between cultures reveals that behavioral intentions and intrusiveness differ significantly between the subjects in the U.S. and Mexico.

Table 12: Means of Dependent Variables by Country

	United States Sample	Mexican Sample	Difference (two-tailed tests)
Behavioral Intentions	11.2 (N=272)	15.4 (N=264)	$t=-8.501$; 525.2 df; $p=.000$
Recall of Site Content	7.83 (N=272)	7.71 (N=264)	NS
Recall of Ad Content	11.28 (N=208)	11.15 (N=209)	NS
Intrusiveness of Ads	23.66 (N=208)	26.71 (N=209)	$t=-2.457$; 412.18 df; $p=.014$

Results of hypothesis tests for the separate samples were not markedly different than those of the overall sample, however, more tests failed to reach significance. Failure to reach significance is most likely caused by the decrease in statistical power from halving the number of subjects in the separate tests.

Two statistics that were examined rather closely were behavioral intentions and intrusiveness of ads, given the significant differences between the two samples. Table 13 provides the means for each subsample for behavioral intentions, revealing that U.S. students were not as affected by ads as the Mexican students. It is possible that U.S. students are more accustomed to seeing advertisements, and just come to expect them. As shown in Table 14, the Mexican sample also shows more of a difference in behavioral intentions for pop-up versus in-line ads.

Table 13: Behavioral Intentions with and without Ads Across Samples

Behavioral Intentions	With Ads	Without Ads	Difference
U.S. Sample	10.98	12.00	$t=1.32$; 270 df; NS ($p=.094$)
Mexican Sample	14.99	17.42	$t=2.64$; 233 df; $p=.005$

Table 14: Behavioral Intentions by Ad Type Across Samples

Intrusiveness of ads	In-line Ads	Pop-up Ads	Difference
U.S. Sample	10.55	10.93	$t=.427$; 135.4 df; NS ($p=.335$)
Mexican Sample	14.40	16.29	$t=-1.875$; 138 df; $p=.031$

Finally, intrusiveness was examined in more detail to reveal that both sub-samples were affected by the type of advertisement (in-line versus pop-up) in nearly the same way. Table 16 provides the intrusiveness means for each sample across ad type. Congruence findings remained non-significant for both subsamples as with the pooled sample.

Table 16: Intrusiveness by Ad Type Across Samples

Intrusiveness of ads	In-line Ads	Pop-up Ads	Difference
U.S. Sample	19.76	24.47	$t=2.475$; 133.2 df; $p=.008$
Mexican Sample	22.47	27.68	$t=-2.073$; 134.4 df; $p=.020$

Limitations

As in most studies, there are several limitations that should be kept in mind when considering the results of this study. First, the subjects were college students, and the results might not generalize to the rest of the population. Fortunately, Voich (1995) found students to be particularly representative of values and beliefs of individuals employed in a variety of occupations. Also, we did not expect students to react differently to the stimuli than would other individuals. In other words, the materials were designed to tap rather “invariant” (Simon, 1990) activities such as aspects of Web use.

Another limitation in this study is that it took place in a laboratory, and did not involve sites that participants navigated in their typical context. However, the laboratory controlled for all other potential factors that could influence the outcomes that were measured.

Finally, congruence is not a completely objective factor, and the content of some advertisements might actually be partially congruent to the content of its hosting website. Also, much of the issue of congruence, like beauty, exists in the mind of the beholder. Future studies should address the issue of congruence to pin down the construct even further.

Conclusions and Future Research

The findings suggest that advertisements do have significant effects on retention of the on-line experience. The mere existence of ads decreases retention of both site and ad content. Pop-up ads reduce a person’s retention of both site and ad content more severely than in-line ads. Also, advertising content that is non-congruent with the site’s content seems to lead to greater effort in reconciling the differing content, and ultimately greater memory of both the website and

the advertisement.

Intrusiveness is also important for both website designers and advertisers. Pop-up ads seem to be more intrusive than in-line ads, implying that users should not be interrupted from their online tasks to close the extraneous windows.

Based on a report by Formichelli (2003), both AOL Time Warner and Microsoft announced in October 2002 that they would eliminate the majority of pop-up ads on their Internet services in response to rising complaints from users. In their eyes, the loss of advertising dollars is worth the boost in public image as a result of the policy change” (p. 23).

As Lyman (2003) points out, pop-up ads can interrupt, slow or even ruin a Web search but they can be eliminated using free, third-party software that deflects unwanted browser windows”. However, pop-up ads are not likely to disappear completely but will become less prevalent with concerns of possible brand damage (Lyman, 2003).

Future research is particularly rich in this area. Focusing on other factors, such as trust and attribution, could reveal interesting findings and explain more thoroughly the findings of this study. In addition, introducing different ad types and locations could demonstrate differential impacts on users. For example, varying the size and location of ads and controlling for all other factors could isolate whether retention can be explained more by size or location. Finally, other cultures can be examined to see if there are systematic differences that apply to other countries.

The An advertising “arms race” is developing, and will be very interesting indeed as software developers provide blocking of advertisements, and advertisers modify the technologies used, to avoid the blockers. While the battle continues, it is important to provide controlled studies that inform us about just what are the effects of blocking, or failing to block, online advertising.

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