Primacy and Recency Effects on Clicking Behavior

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As consumers and business increasingly use the Internet, understanding how and why users choose website links or email links becomes correspondingly important. Two recent articles report a monotonic effect of link order and clicking on a link; this means that the higher a link’s position in a list of links, the greater the probability that visitors will click on that link. The difference in probability of clicking has important implications for designing webpage navigation for visitors.

We report on two field experiments that confirm and extend these studies, showing the efficacy of the first link, a primacy effect. Visitors to a site, however, also show an increased tendency to click on links at the end of the list, a recency effect that previous studies failed to note. This article discusses the potential reasons for recency effects, and the implications of serial position effects more generally.

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Introduction

“Location, location, location” is a mantra across many businesses. Restaurateurs and retailers seek a prime location when building a facility, packaged goods manufacturers seek prime shelf space in a grocery store, advertisers want to be the first or last in a pod of TV advertisements, and AAA Plumbing strives for the top listing in the yellow pages’ plumbing section. A link’s location on a web page is also an important factor influencing visitors to click more or less on a particular link.

Information on how visitors navigate websites is critical to online success (Bucklin & Sismeiro, 2003; Dréze & Zufryden, 1997; Johnson, Bellman, & Lohse, 2003; Lee, Podlaseck, Schonberg, & Hoch, 2001), and the digital nature of online activities helps study this area (Johnson, 2001). Research on factors related to site
navigation suggests that links, colors, images, page design, and site design can influence how visitors navigate a website (Drèze & Zufryden, 1997; Mandel & Johnson, 2002; Murphy, Hofacker, & Bennett, 2001).

This article investigates a seldom-reviewed aspect of Internet design: how a link’s serial position on the page influences clicking on that link. A study by Ansari and Mela (2003) suggested a positive relationship between the serial position of a link in an email and recipients’ clicks on that link. Similarly, Drèze and Zufryden (2004) implied a positive relationship between a link’s serial position and site visibility. Thus, ceteris paribus, website designers and managers would place their most desirable links toward the top of a web page or email and their least desirable links toward the bottom of the web page or email.

Yet findings of a monotonic relationship (Ansari & Mela, 2003; Drèze & Zufryden, 2004) contradict a common positioning effect found across other media: recency effects (Asch, 1946; Crowder, 1976; Krosnick & Alwin, 1987). A study by Hofacker and Murphy (2005) using designed experiments on live websites found both primacy and recency effects for clicking and page position similar to those found in other media. However, their study did not provide statistical tests of recency, and presented the links in two columns rather than a single column.

A review of positioning effects across various media, situations, and criterion variables supports a primacy effect favoring the first position in an array of stimuli (e.g., ads), and also finds considerable evidence of a recency effect that favors a position at the end of a sequence of stimuli. While research suggests that primacy effects occur in online environments (Ansari & Mela, 2003; Drèze & Zufryden, 2004; Hofacker & Murphy, 2005), the results are less clear for recency effects. Should one place high-value or low-value links at the bottom of a web page or email? This article reports on two field experiments that found evidence of both primacy and recency effects in clicking behavior.

**Literature Review**

The literature on persuasion has investigated position effects for decades, first showing primacy effects and then showing recency effects (Haugtvedt & Wegener, 1994). Similar research across disciplines and media has demonstrated the importance of an item’s position in an ordered list—its serial position—in dependent measures of memory, attitude formation, and choice. This research shows both recency and primacy effects across many media, often mediated by the individual’s involvement or motivation to think about the object or activity.

**Position Effects in Memory**

Cognitive psychologists found that early items in a list have a memory advantage (Crowder, 1976). This advantage (a primacy effect) is due to the first items having less competition from other items for limited memory capacity (Waugh & Norman, 1965). The last few items in the list also receive a memory advantage (a recency
effect), because these items may still be available in short-term memory during the memory test.

Media research has shown that television viewers are more likely to recall advertisements placed at the end of a commercial break than ads placed toward the beginning (Duncan & Murdock, 2000). This memory advantage for later advertisements also occurs with viewers who change channels or leave the room during commercial breaks (Tse & Lee, 2001), and may appear because of the low involvement nature of television viewing (Krugman, 1965).

Position Effects in Attitudes and Intentions
Position effects are also common in research on attitude formation, intention to purchase, and liking an advertisement, brand, or company. First impressions (primacy effects) are important, as Asch (1946) demonstrated in his pioneering experiments investigating persuasion. Subjects held a more favorable attitude toward a person described as “intelligent-industrious-impulsive-critical-stubborn-envious” than described as “envious-stubborn-critical-impulsive-industrious-intelligent.” The position of an adjective significantly influenced the subjects’ attitudes toward the person.

Impression formation is an important factor for advertisers seeking attitudinal change (Haugetvedt & Wegener, 1994). Zhao (1997) found a primacy effect on the liking of advertisements (attitude toward the ad), an indicator of potentially favorable advertising effects for a brand (MacKenzie, Lutz, & Belch, 1986).

Buda and Zhang (2000) found a primacy effect for information presentation and the attractiveness, willingness to purchase, and perceived performance of a product. However, their results suggest that the source of the information may mediate position effects on their respondents’ reported brand attitudes and purchase intentions. Based on their results, Buda and Zhang (2000) argue that advertisers should present information from a nonexpert first and from an expert last (recency effect) to have the best chance to affect brand purchase favorably.

Two studies using student samples found position effects influencing an individual’s perceptions of a corporation or person on trial. The first study, which varied the order in which participants reviewed six affidavits, found strong recency effects but minimal primacy effects on the verdict and importance of the affidavits (Carlson & Russo, 2001). A second experimental study judged a corporation via the president’s letter to stockholders. Presenting the good news first and then the bad news, versus presenting the bad news and then the good news, yielded better perceptions of the corporation’s investment strength and future performance (Baird & Zelin, 2000).

Finally, the order of questions in a survey can influence the respondent’s stated beliefs, attitudes, intentions, and behaviors. The concept of “self-generated validity” suggests that respondents remember their earlier responses, which they then use to calibrate subsequent responses. This self-generated validity can compromise the veracity and reliability of those later responses (Feldman & Lynch, 1988; Lacy, 2001; Schuman & Ludwig, 1983).
Position Effects in Preference and Choice
While the previous examples dealt primarily with position effects in memory and reported beliefs or intentions, research suggests a sometimes tenuous link between reported and actual intentions, beliefs, and behavior (Alba & Hutchinson, 2000; Blair & Burton, 1987; Lee, Hu, & Toh, 2000; Nisbett & Wilson, 1977). Research, as well as anecdotal evidence, suggests that position effects extend beyond memory and reported attitudes or intentions.

Position effects can influence actual behavior. For example, in an eye-tracking study of reading Yellow Pages, experimental subjects tended to view and choose ads that were at the top of the alphabetical list (Lohse, 1997). This result helps explain why restaurant managers place high margin items at the top of a menu, as customers tend to order items near the top of a menu more often than when those same items are at the bottom (Ditmer & Griffin, 1994; Miller, 1980). This top-of-the-page positioning resembles newspaper editors deciding which stories to run above or below the fold.

In addition to menu items and newspaper stories, there seem to be positioning effects in choosing elected officials. The 1998 Democratic primary in New York City rotated the candidates’ name-order on the voting ballot by precinct. In 71 of the 79 precincts, “candidates received a greater proportion of the vote when listed first than when listed in any other position” (Koppell & Steen, 2004, p. 267). This primacy advantage was larger than the winner’s victory margin in seven precincts. Voters may have chosen candidates in those races simply because of their position in a list of candidates.

Finally, Krosnick and Alwin (1987) found both primacy and recency effects with survey choice options. When respondents chose from a printed list during a face-to-face interview with cards representing their choices, they tended to pick the first categories listed on the card. When the respondents heard the options, however, they tended to pick the last categories. Thus there was a primacy effect in the visual choice task, but a recency effect in the auditory choice task.

Involvement and Position Effects
The concept of involvement seems to mediate and further explain position effects. In a study of 188 races in Ohio’s 1992 elections, Miller and Krosnick (1998) found candidate primacy effects in almost half the races. Yet, in races that voters perceived as high involvement—with party affiliation listed, high levels of publicity, and incumbents involved—the effect of the candidate’s serial position was less important.

As noted earlier, the recency effects found in audiences’ memory of television commercials (Tse & Lee, 2001) also appear to support involvement influencing position effects. Similarly, Anderson and Maletta (1999) investigated the role of risk in how auditors estimated the likelihood of error and audit-hour planning. They found primacy effects for an auditor’s likelihood of error judging audit-hour planning for low risk conditions, but found no position effects in high-risk conditions.
The individual’s perceived risk with the decision is often a criterion for determining consumer involvement with a potential purchase (Arnould, Price, & Zinkhan, 2004).

The order of presenting information seemed to influence how almost 700 patients evaluated two medical treatments, but again only in a low-involvement situation (Bergus, Levin, & Elstein, 2002). A field experiment alternated the order of presenting a treatment’s benefits and risks to subjects with symptomatic carotid artery disease. Patients given a brochure on a low-risk treatment (aspirin therapy) were significantly more favorable and more likely to consent to aspirin therapy when the brochure mentioned the benefits first. There were no position effects, however, with brochures describing the high-risk and surgically invasive carotid endarterectomy treatment.

Position Effects in the Online Environment
The role of involvement may be more complex and extend to message relevance. The literature tends to agree that

when presented with two conflicting persuasive messages, people who are highly motivated to think tend to be more influenced by the first than the second message (primacy effect), whereas those low in motivation to think show reduced primacy effects (or even recency effects). (Petty, Tormala, Hawkins, & Wegener, 2001, p. 332)

Drawing upon the theory of the Elaboration Likelihood Model (Petty & Cacioppo, 1986), Haugtved and Wegener (1994) suggested that message relevance may influence choices in a communication environment. The authors argued that high levels of message-relevant elaboration lead to greater primacy effects, while low levels of message-relevant elaboration lead to greater recency effects. The implication is that depending upon the relevance to the individual of the web page or email and the respective links, recipients should favor the first items, the last items, or both first and last items in a list of links on a web page or in an email.

The results of an experiment with online surveys showed primacy effects in both participation rates and responses (Frick, Bächtiger, & Reips, 2001). Fewer participants dropped out when asked for personal information at the beginning (10%) than at the end of the survey (18%). Furthermore, asking participants for personal information first yielded more information than asking for personal information at the end of the survey.

Hoque and Lohse (1999) manipulated an online interface to match the traditional offline Yellow Pages and found evidence of a primacy effect only. While Frick et al. (2001) and Hoque and Lohse (1999) used laboratory environments, with high internal reliability, generalizing their results to web page navigation is unclear. Both studies seemed to induce high task involvement, but appeared to be more text based than are many popular web pages.

Ansari and Mela (2003) provided perhaps the first analysis of serial position-related clicking behavior in emails or web pages in their efforts to “develop a
statistical optimization approach for customization of information on the Internet” (p. 131). The authors modeled their optimization using clickstream data from 1,048 users who received opt-in emails from a leading website. They noted only a primacy effect, as in Hanssens and Weitz’s (1980) magazine ad placement study and the Hoque and Lohse (1999) Yellow Pages study reviewed earlier. Based in part on their finding of primacy, Ansari and Mela (2003) then created optimal sequences of email links.

Ansari and Mela (2003) raised the specter of recency, noting that some users “tend to scroll to the bottom of the e-mail and then click on one of the links at the bottom” (p. 142). The authors also noted that email heterogeneity led to some emails showing a greater effect of link order than others (p. 141), but their results supported only a monotonic effect of position and clicking behavior.

In a study of an outside link’s contribution to a website’s online visibility, Drèze and Zufryden (2004) drew on the Ansari and Mela (2003) study to predict a monotonic serial position effect. Their results “suggest that both position of a link on a result page and the position on the page affect visibility (i.e., the higher up the link appears on a page, the better)” (p. 32).

While the results of these two studies may prove to be general, there was a similar confound in both studies. The Ansari and Mela (2003) model was calibrated on pre-existing emails created by the website managers, and Drèze and Zufryden (2004) used search-engine results pages and links on existing websites. One could ask, then, are the early serial positions popular because consumers are more likely to click on links at the top of the page, or do online marketers tend to put their best links early in the link sequence? Certainly, search engines list their results in decreasing order of relevance.

**Experimental Findings of Position Effects Online**

Rather than ask visitors what they will do or remembered doing on a site, website researchers track actual behavior (Bucklin & Sismeiro, 2003; Drèze & Zufryden, 2004; Johnson et al., 2003; Mandel & Johnson, 2002; Murphy et al., 2001). Using actual site visitors provides high external validity (Cutler, 1990; Hoque & Lohse, 1999), while the automated control and digital record of a computer-mediated environment gives high internal validity (Drèze & Zufryden, 1997).

Hofacker and Murphy (2005) reported a study that combines the internal validity of a designed experiment with the external validity of using actual websites. They randomly allocated link material to link position using a Latin Square design (Holland & Cravens, 1973) in order to separate link content from link position and therefore account for the impact of link position on link choice.

The site, a southeastern U.S. hospitality site, had a menu of links arrayed in a four-row by two-column menu. The upper location, at 9.2%, was the most clicked position (primacy effect), but the lower right location, at 7.7%, was the second most popular link choice. While these results suggest primacy and recency effects, there were no reported tests of statistical significance. In addition, the two-column design complicates interpreting the results (see Figure 1).
The next section presents two field experiments on live websites, developed to test for serial position effects. These further demonstrate using randomized experiments on live websites to reveal consumer behavior processes. The results should demonstrate practical implications for website management and support the following hypothesis:

H1: Controlling for content, visitor clicking behavior on a list of links will show primacy and recency effects.

Methodology

A consulting arrangement with a popular Florida restaurant provided the researchers with the availability of a web page for conducting experiments. The first experiment, with six links, used six versions of the page. The second experiment, with seven links, used seven versions of the page. The links gave information on the restaurant’s offerings and the geographic region including events, travel directions, and local attractions.

Both experiments ensured that all six or seven links fit inside a 13” monitor set at a 640 by 480 screen resolution on the default Internet Explorer browser settings. Depending on the visitor’s computer and browser configuration, longer link options (i.e., eight or more) may have presented one or more links below the bottom of the screen. This would make it problematic to determine the position in which visitors viewed later links in the sequence, and could add a confound to any effects found. As the point of the experiments was to investigate recency effects, no experiments with a greater number of links were conducted.
The experiments followed a Latin Square design such that each link, whether represented in either the six- or seven-link experiment, appeared in every serial position in one of the page versions. A Common Gateway Interface (CGI) program randomly assigned one of the six or seven page versions to each visitor. Figure 2 shows this process, using three links for illustrative purposes. The CGI program and Latin Square ensure that link content and link position were orthogonal rather than confounded.

If visitors used the reload button or reclicked on a link before the page arrived, data cleaning deleted these visitors, as there was no guarantee that they received the same experimental condition on the second occasion. Further data cleaning deleted requests without a return code of 200 (a successful page request) and those generated by automatic Web crawling software (Murphy et al., 2001).

This methodology empirically tested the influence of design changes on clicks to each link under rigorous, randomized experimental conditions. The results generalize only to the population of visitors to the page containing the links.

Results

Experiment One, Six Links
The first experiment ran over two different 10-week data collection periods, with 1,641 visitors in the first period and 2,247 visitors in the second period. The data collection for both periods was identical except that they occurred two months apart. Given no significant differences in the responses between the two samples, the two data sets were combined for further analyses. Figure 3 shows the data from the experiment. As with Hofacker and Murphy (2005), visitors tended to click the first position most frequently. This supports a primacy effect in link preference. The click-through rate decreased from...
serial positions 1–5, but then increased on the last position six. Click-through rates varied from a low of 7.3% for position five, to 10.5% for position one (see Figure 3).

A maximum likelihood logistic regression (Montgomery, 2001) was used on the aggregate 36 cells of the six by six Latin Square design. This design provided five degrees of freedom for each of the effects of serial position, the link, and the Latin Square condition (blocks). The five degrees of freedom for serial position were coded by five orthogonal trend polynomials. The linear and quadratic terms were significant at $p < .001$, with $\chi^2(1) = 16.97$ for the linear component and $\chi^2(1) = 23.14$ for the quadratic. These results support the visual impression of primacy and recency effects apparent in Figure 3 and confirm the hypothesis.

Experiment Two, Seven Links
A second experiment using seven links (instead of six) ran on a different web page from the same website in order to help generalize and support the results. This time, rotating the seven links through each position in a single column created a seven by seven Latin Square design. Because this page was more popular than the first page, the experiment ended after eight weeks and 18,134 visits. An analysis of the data used an ML logistic regression with six degrees of freedom for testing the link, serial position, and Latin Square treatment conditions. As before, there were significant ($p < .001$) linear [$\chi^2(1) = 324.97$] and quadratic [$\chi^2(1) = 257.04$] effects. In addition, all other polynomials of the trend components were significant at $p < .001$. Figure 4 plots the results of this experiment. The analysis and Figure 4 offer additional support for the hypothesis.
Summary and Conclusions

One of the powers of digital marketing is the ability to produce and store large quantities of consumer behavior data automatically. We believe that the approach in this study complements data mining and other analytical techniques used on large, pre-existing, clickstream data sets. This study, using random assignment and modest six-by-six and seven-by-seven, experimental designs uncovered consumer behavior details interesting from both a theoretical and practitioner point of view.

These experimental results support the idea that primacy, as investigated in two earlier online studies (Ansari & Mela, 2003; Drèze & Zufryden, 2004), may affect behavior and that the primacy effect is not an artifact of a correlational design. More interestingly, the results contradict a suggested monotonic relationship (Ansari & Mela, 2003; Drèze & Zufryden, 2004) and support Hofacker and Murphy’s (2005) finding that the preference for clicking on the last link in a menu increases relative to prior items—a classic recency effect.

Pirolli and Card (1999) suggest the analogy of a visitor exploring a web page to an animal foraging for food. The calories spent foraging for food must be less than the calories that the food provides. Similarly, the wording of a hyperlink promises a potential benefit to a site visitor while the time that the visitor spends reading and choosing a link represents a cost. As both experiments in this article controlled for link wording (potential benefit), the higher click-through associated with some link positions implies that visitors perceive reduced costs for these links. Given English and most other languages’ reading habits, the first item in a list has a low search cost and represents the easiest link to click.

Figure 4 Click-through as a function of link serial position (seven items).
As for the recency effect, what might be the reason for reduced cost? One scenario is that many visitors tend to read the entire menu of links. The last item remains in short-term memory and is thus easier to choose than searching for previous items. Alternatively, visitors may interrupt the usual top-to-bottom reading sequence and jump to the last item without reading the items in between. While these two notions remain hypotheses pending further experimental work, it is important that companies understand visitor search behavior. The design of pages should take both company goals (clicks, online sales, offline sales, customer retention) and visitor goals (minimizing effort and maximizing benefit) into account.

The ability to control for message relevance, a limitation of this study, offers another fruitful research avenue. High message relevance should intensify primacy effects and low message relevance should intensify recency effects (Haugtvedt & Wegener, 1994; Petty et al., 2001). Advertising links such as banners are often irrelevant to the visitor’s goals for being on a website, as compared to content links that may motivate the visit. The former should be subject to recency effects more than the latter, and the content links should be subject to primacy effects more than the advertising banners. Future research could investigate the primacy and recency effects of high- versus- low relevance links.

Finally, the results of this study suggest that an Internet marketer should put the most lucrative or important link first in the menu, but perhaps also place an important link as the last link in the menu. The Internet, a direct marketing and communication channel, suits experiments such as this and can help address many decisions facing online marketers.

References


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