

# Optimal Search Engine Marketing Strategy

Ravi Sen

**ABSTRACT:** Buyers using search engines to look for information tend to trust and follow links displayed in the editorial section of the search-results page. Most on-line sellers, however, do not invest in search engine optimization (SEO) to get higher search-results rankings for their listings, but instead prefer paid placements. They explain that SEO is more expensive than paid placements, produces results that do not justify its cost, and does not consistently lead to high search-results rankings. This implies that sellers would invest in SEO if it were less expensive and its rankings were more consistent. However, even if SEO and paid placement cost the same, and SEO always produced high rankings, paid placement would still be the search engine marketing (SEM) strategy of choice for most on-line sellers. Interestingly, no optimal SEM strategy includes SEO. These findings are especially significant for advertising professionals who have to justify investing in paid placements despite overwhelming evidence that buyers ignore them and follow links in the editorial section of the search-results page.

**KEY WORDS AND PHRASES:** E-commerce, marketing, paid placement, search engine, search engine marketing, search engine optimization, sponsored link.

According to a recent report by SEMPO (Search Engine Marketing Professional Organization), spending on search engine marketing (SEM) programs in the United States and Canada in the year 2003 amounted to \$4.1 billion [21]. The figure is projected to grow to about \$7 billion [17] by 2007. The reason for investment on this scale in SEM activities is obvious. Compared with the slow growth in the viewership of network TV (a popular and currently the dominant advertising medium), on-line search volume continues to grow at 10–20 percent per year [16], and search engines account for most on-line searches [12]. The dependence of the browsing population on search engines makes it important for on-line sellers to develop marketing strategies that improve their visibility in the “search results” provided to potential buyers [1, 10]. Marketing strategies of this kind are often referred to as SEM strategies. They generally consist of one or more of the following actions:

- *Keyword-related banner advertisements:* One of the earliest and still used SEM strategies is to buy keyword-related banner advertisements on the search-results page. However, a study by the NPD Group found that standard banner or button advertisements are not as effective as search listings when it comes to brand recall, favorable opinion ratings, and fostering purchases [30]. In unaided recall, search listings outperformed banners and buttons by three to one. Therefore, on-line sellers need to get listed in the search-results pages as soon as they register with the search engine. To achieve this they have the following options:
- *Paid submission/paid listing and paid inclusion for regular updates:* To avoid long delays, sellers can pay search engines to ensure that their Web site is reviewed within a fixed time frame (generally a week)

and starts showing up in the search-results pages [30]. For example, Yahoo! Commercial accepts free submissions. But a seller can speed up the registration process by choosing the “Business Express” option and paying a one-time fee that guarantees a review within one week. Sellers can also pay for regular updates, a feature offered by Inktomi, the search engine that supplies results to, among others, HotBot, AOL, and MSN. A seller using this option pays a small fee per page and in return gets a guarantee that the Inktomi “spider” will visit the seller’s Web site every 48 hours for one year, ensuring that the seller’s URL is added to the index and that its listing is regularly updated. Just being listed in the search results is not enough, however. Sellers should aim to maximize the traffic that comes to their Web sites via search engines. To maximize this traffic, sellers need to obtain preferential placement of their Web site addresses, so that they will be one of the top 20 matches. A seller’s site is not very likely to be visited if it is listed in the “back pages” of a search engine’s results. Recent research has shown that 90 percent of users hardly ever go beyond the first three pages of search results—approximately the top 30 listings—for a single search [30]. To make sure that they are included in the top listings, on-line sellers have two options:

- *Search engine optimization (SEO)*: Sellers can improve their listings on the search-results pages by modifying their site codes to make them more relevant and therefore more search-engine compatible [17, 34]. For instance, they can modify the title tag, meta-tags, heading tags, links, and other areas of the page in order to ensure that the search engine’s algorithm gives the page a higher score in comparison to other pages that qualify to be displayed in the search-results pages.
- *Paid placements (PP)*: Sellers can pay the search engine for placement in the sponsored section of the search-results pages [8, 17, 25, 26, 27, 28, 29]. This is a faster way to obtain visibility, because it can take up to 120 days after submission before the initial results of an optimization campaign become visible. A growing number of Web publishers are allowing search engines like Google to crawl through the content of their pages and place relevant text advertisements in the right-hand margin. From the standpoint of the on-line seller, this is just an extension of paid placement and an additional incentive to invest in paid-placement programs. However, advertisers should keep in mind that buyers trust information in the editorial section more than information in the sponsored section [9, 11].

With all these options, a seller can implement only one of the aforementioned SEM strategies or a combination of two or more of them. However, the seller has to balance the expense of implementing an SEM strategy with the profits it is expected to generate. Empirical evidence shows that most SEM dollars (approximately 82 percent of the amount spent on SEM activities) go to paid-placement campaigns [30]. Much less is invested in SEO. For instance, only 12 percent of the amount spent on search marketing in 2003 went to SEO.

The rest, about 4 percent, went to other SEM activities, such as paid inclusion. The distribution of SEM dollars between SEM options suggests that paid placement is perceived as the most effective means of achieving increased visibility in the search-results pages of a search engine. Increased visibility, in turn, should result in more visits to the seller's Web site and, therefore, more revenue for the seller. However, there is strong empirical evidence that paid placement may not be the best SEM strategy for on-line sellers. Researchers on search-engine marketing have reported that 60–86 percent of search-engine users click on the displays in the editorial section when conducting on-line queries, whereas only 14–40 percent of search-engine users click on the sponsored links [9, 11]. If SEO can generate more traffic for the same keywords, why are companies spending more on paid placement?

Trade experts explain that it costs less to purchase paid placements for campaigns for thousands of keywords than to implement SEO programs for even a few hundred keywords [13]. The main hurdle to implementing an effective SEO program is the fact that each search engine has its own requirements, which means that a Web site optimized for one search engine is not necessarily optimized for the others. Pages optimized for Google, for instance, should clearly and accurately describe the content, and cannot participate in link-exchange schemes designed to the site's ranking. But the same page is not necessarily optimized for Yahoo, which requires that pages not be automatically generated or of little "value," and not participate in cross-linking sites just to inflate a site's apparent popularity. The many different requirements make search-engine optimization much harder and arguably more costly to implement. In addition, SEO does not consistently result in high rankings and therefore leads to unpredictable traffic. This is because search engines tend to vary their ranking algorithms on "natural search listings," and in response, SEO specialists have to "guess" and adapt to ever-changing strategies and tactics to either maintain their positions or improve their rankings.

If high implementation costs and inconsistent rankings are the main drawbacks of SEO, then presumably SEO would be widely adopted if it were less costly and developed strategies that would produce more consistent rankings. Given the available technology, it is quite possible to have mirror Web sites optimized for different search engines. The price of Web site hosting services is decreasing, so this approach is bound to become less costly. Assume for a moment that SEO strategies that consistently result in high rankings on the search-results page will also be available in the near future. In such a scenario, one would observe an increasing number of on-line sellers using SEO. However, as shown below, this would not be the case, and paid placements would still be the most popular SEM strategy.

The text that follows develops an analytic model that makes it possible to compare search engine marketing strategies in terms of their impact on the profitability of on-line sellers. The model is simple enough to permit analytic results but at the same time captures the essential features of buyers' on-line search intensity and the competition between on-line sellers. The model is analyzed to identify the conditions in which on-line sellers prefer one SEM strategy over others.

## **Elements of the Model**

### ***On-line Buyers***

On-line buyers use search engines to search for product and price information. After completing the search process, a buyer forms a consideration set that consists of the sellers whose Web sites were visited during the search. The buyer discovers these seller Web sites by browsing through either the editorial section or the paid-placement section of the search-results pages generated in response to the keyword search. Because the available empirical evidence suggests that most on-line searchers/buyers ignore the sponsored links displayed in the paid-placement section [9, 12, 21], the model assumes that buyers/sellers check out the sponsored listings only if they are unable, during normal search activity, to find one or more sellers in the editorial section of the search-results page [9].

### ***On-line Sellers***

The on-line market linked to certain keywords consists of two sellers named Seller A and Seller B selling products perfectly related to the keyword. These sellers are selling an undifferentiated product (i.e., all buyers have a common valuation of the product). However, potential on-line buyers have different "opinions" about the on-line sellers, and, therefore, everything else being equal, would prefer to buy from their preferred on-line seller. A buyer's preferences for the two on-line sellers are captured in the form of the "transportation" cost incurred when buying from one or the other seller [11]. The transportation cost can be viewed in terms of how "comfortable" the buyer is when buying from one or the other seller. This comfort level results from several factors the buyer considers when making an on-line purchase (e.g., privacy policy, security, return policy, shipping and handling policy). Note that the discomfort cost comes into play only when a buyer has complete information about both sellers. Finally, the model assumes that the production cost (or the cost for which the seller bought the product from another seller/producer) is zero for both sellers. This simply means that in the following analysis, all prices have to be interpreted as deviations from zero [6, 31].

### ***Search Engine Marketing (SEM) Strategies***

The model ignores keyword-linked banner advertisements for two reasons. (1) This form of content promotion deals with a separate area on the search-results page that is set aside for advertisements (e.g., banners and buttons) and is already addressed by a large body of research on Internet advertising [2, 4, 16, 20, 21]. (2) Given the relative ineffectiveness of banners and pop-ups in directing traffic to advertiser Web sites and the possibility of negative reactions from potential buyers, this form of advertising is expected to decline in coming years and will not play a significant role in SEM strategies [5, 30]. The

model assumes that the cost of paid inclusion and regular updates is zero, because it is insignificant when compared to the cost of paid placement and SEO. Finally, the model also assumes that both sellers have been in the on-line market for a long time and therefore their on-line presence has been registered by the search engine. This leaves the on-line sellers with four SEM strategic options.

#### *Strategic Option 1: Do Nothing (DN)*

This strategy carries a zero cost for the seller. A seller adopting the DN strategy is assumed to have paid for paid inclusion and paid updates but has decided to do nothing else. In the absence of any SEM strategy, the probability that Seller A or Seller B would rank high in the editorial section of the search-results page is denoted by  $\alpha$ , where  $0 < \alpha < 1$ . For any seller, the value of this probability (i.e.,  $\alpha$ ) is influenced by the algorithm the search engine uses to rank the results generated by the search keywords, the search intensity of the on-line buyers, and whether the seller has undertaken search engine optimization (SEO). An on-line seller has no control over the search engine's ranking algorithms and the buyer's on-line search behavior. However, the seller can invest in SEO to increase the probability of achieving a relatively high rank in the editorial section of the search-results page. This leads to the second strategic option.

#### *Strategic Option 2: Invest Only in Search Engine Optimization (SEO)*

The model assumes that the implementation of SEO requires a fixed investment of  $c$ , and the benefits include the assurance of being consistently listed in the top few search results in the editorial section of the search-results page (i.e.,  $\alpha = 1$ ). This implies that a seller with a search-engine-optimized site is always in the potential buyer's consideration set, because all buyers browse through the top-ranked listings in the editorial section of the search-results page.

#### *Strategic Option 3: Invest Only in Paid Placement (PP)*

For the sake of simplicity, this option is also assumed to incur a total fixed cost of  $c$ . The PP strategy assures a listing in the sponsored section of the search-results page. The model assumes that once a seller pays for paid placement, it is listed in the sponsored section. However, it could also show up with a high rank in the editorial section (with probability  $0 < \alpha < 1$ ). However, a buyer would browse the paid-placement section only if both sellers are absent from the top-ranked links displayed in the editorial section of the search-results page. The probability of this happening is  $(1 - \alpha)(1 - \alpha)$ .

#### *Strategic Option 4: Invest in Both SEO and PP*

A seller adopting this strategy is assured of both a link in the sponsored section and a place among the top-ranked links displayed in the editorial section (i.e.,  $\alpha = 1$ ). This option has the benefit that the seller is always present in the consideration set of an on-line buyer. A seller adopting this strategy incurs a total fixed cost of  $2c$ . Given this definition of strategic option, it is easy to see that this strategy will always be dominated by Strategic Option 2, because for any seller the probability of being part of a buyer's consideration set remains the same with both strategies (resulting in the same revenues), while the cost of implementing Strategic Option 4 (i.e.,  $2c$ ) is more than the cost of implementing only SEO (i.e.,  $c$ ), resulting in higher profits when Strategic Option 2 is implemented. Therefore, Strategic Option 4 (i.e., invest in both SEO and PP) will be ignored in the subsequent analysis.

#### **Demand Distribution**

Depending on the SEM strategy used by the two sellers, an on-line buyer could end up with three different consideration sets.

- *Both sellers absent from consideration set:* In this scenario, no on-line market exists for the sellers, because the buyer cannot find them during the normal course of an on-line search, which is limited to just a few pages and links [9, 30].
- *Only one seller in consideration set:* This happens when one seller adopts the SEO strategy and is always listed among the top few links on the search-results page (i.e., for this seller  $\alpha = 1$ ), while the other seller does nothing and misses out on being considered by the buyer (with probability of  $1 - \alpha$ ). The probability that only one of the sellers is in a buyer's consideration set is denoted by  $\Phi_i$ , when  $i = A, B$ , and when this happens, the demand faced by a seller is  $D_i^1 = 1$ , where

$$i = A, B. \quad (1)$$

- *Both sellers in consideration set:* This happens if both sellers adopt the SEO strategy or if both decide to do nothing but show up in the top few listings of the search-results page (with probability of  $\alpha^2$ ). The probability that both sellers are in a buyer's consideration set is denoted by  $\Phi$ . When both sellers are in the consideration set, they face a competitive duopoly market. In this case, the buyers are assumed to be uniformly distributed between 0 and 1 with density 1. For simplicity, the two sellers are assumed to be located at the two extremes of this "comfort level" spectrum—in other words, Seller A is located at  $x = 0$ , and Seller B is located at  $x = 1$  [31]. In addition, buyers are assumed to have a transportation cost of 1. Thus, a consumer at "comfort level"  $x$  from Seller A will incur a total discomfort cost of  $x$  when buying from Seller A and a total discomfort cost

of  $(1 - x)$  when buying from Seller B. The consumers have unit demand (i.e., each consumes one or zero unit of the good). When Seller  $i$  charges a price of  $P_i (i = A, B)$ , a consumer who is indifferent between the two sellers is located at  $x$ , where  $x$  is given by equating generalized costs, i.e.,  $P_A + x = P_B + (1 - x)$ , and the seller's respective demands are

$$\left. \begin{aligned} D_A^2 &= \frac{1}{2}(P_B - P_A + 1) \\ D_B^2 &= \frac{1}{2}(P_A - P_B + 1) \end{aligned} \right\} \quad (2)$$

### Equilibrium in the Price-Setting Game

The total demand for a seller is given by  $D_i = \Phi_i D_i^1 + \Phi D_i^2$ , where  $i = A, B$ , which gives

$$\left. \begin{aligned} D_A &= \Phi_A + \frac{\Phi}{2}(P_B - P_A + 1) \\ D_B &= \Phi_B + \frac{\Phi}{2}(P_A - P_B + 1) \end{aligned} \right\} \quad (3)$$

Each seller chooses a price that will maximize its profit given the price charged by its rival. The profit functions for the two sellers (with cost of SEM as  $c_i$ ,<sup>1</sup> where  $i = A, B$ ) are as follows:

$$\left. \begin{aligned} \Pi_A &= \left[ \Phi_A + \frac{\Phi}{2}(P_B - P_A + 1) \right] P_A - c_A \\ \Pi_B &= \left[ \Phi_B + \frac{\Phi}{2}(P_A - P_B + 1) \right] P_B - c_B \end{aligned} \right\} \quad (4)$$

The profit-maximizing prices are obtained by equating the first-order condition of the profit functions to zero (Eq. 4). The competitive prices, equilibrium demand, and profits under differentiation are given in Table 1.

**Estimation  $\Phi$ ,  $\Phi_A$ , and  $\Phi_B$  for different strategic options:** As shown in Table 1, the profitability of competing sellers depends on the probabilities  $\Phi$ ,  $\Phi_A$ , and  $\Phi_B$ . These probabilities are, in turn, influenced by the SEM strategies adopted by the sellers. The probabilities are computed in Table 2 for various scenarios generated by the SEM strategy choices made by Seller A and Seller B.

**Equilibrium profit functions:** Substituting the values for  $\Phi$ ,  $\Phi_A$ , and  $\Phi_B$  from Table 2 in the equilibrium profit functions from Table 1, we arrive at Table 3.

Price	Demand	Profit
$P_A^* = 1 + \frac{2}{3\Phi}(2\Phi_A + \Phi_B)$	$D_A^* = \frac{1}{2}\Phi + \frac{1}{3}(2\Phi_A + \Phi_B)$	$\Pi_A^* = \frac{1}{2}\Phi + \frac{2}{3}(2\Phi_A + \Phi_B)$ $+ \frac{2}{9\Phi}(2\Phi_A + \Phi_B)^2 - C_A$
$P_B^* = 1 + \frac{2}{3\Phi}(\Phi_A + 2\Phi_B)$	$D_B^* = \frac{1}{2}\Phi + \frac{1}{3}(\Phi_A + 2\Phi_B)$	$\Pi_B^* = \frac{1}{2}\Phi + \frac{2}{3}(\Phi_A + 2\Phi_B)$ $+ \frac{2}{9\Phi}(\Phi_A + 2\Phi_B)^2 - C_A$

**Table 1. Equilibrium Statistics.**

Seller B	Seller A		
	Do nothing	SEO	PP
Do nothing	$\Phi = \alpha^2$	$\Phi = \alpha$	$\Phi = \alpha^2$
	$\Phi_A = \alpha(1-\alpha)$	$\Phi_A = 1-\alpha$	$\Phi_A = (1-\alpha)^2 + \alpha(1-\alpha) = (1-\alpha)$
	$\Phi_B = \alpha(1-\alpha)$	$\Phi_B = 0$	$\Phi_B = \alpha(1-\alpha)$
SEO	$\Phi = \alpha$	$\Phi = 1$	$\Phi = \alpha$
	$\Phi_A = 0$	$\Phi_A = \Phi_B = 0$	$\Phi_A = 0$
	$\Phi_B = (1-\alpha)$		$\Phi_B = (1-\alpha)$
PP	$\Phi = \alpha^2$	$\Phi = \alpha$	$\Phi = (1-\alpha)^2 + \alpha^2$
	$\Phi_A = \alpha(1-\alpha)$	$\Phi_A = (1-\alpha)$	$\Phi_A = \Phi_B = \alpha(1-\alpha)$
	$\Phi_B = (1-\alpha)$	$\Phi_B = 0$	
SEO + PP	$\Phi = \alpha$	$\Phi = 1$	$\Phi = \alpha$
	$\Phi_A = 0$	$\Phi_A = \Phi_B = 0$	$\Phi_A = 0$
	$\Phi_B = 1-\alpha$		$\Phi_B = (1-\alpha)$

**Table 2. Probabilities Associated with Monopoly and Duopoly.**

Notes: The probabilities in all the cells except the first (both sellers do nothing) add up to 1 because in each of these scenarios at least one seller is always in a buyer's consideration set. In cases where both sellers do nothing, the probability does not add up to 1 because there is a probability that neither seller will end up in the buyer's consideration set (i.e., the buyer cannot find them in a "normal" on-line search using a search engine). This could happen if these sellers are listed so far down the list that the buyer gives up and moves on without finding them.

### Optimal SEM Strategy

A comparison of the profit functions for the various combinations of SEM strategy used by both sellers leads to the following propositions:

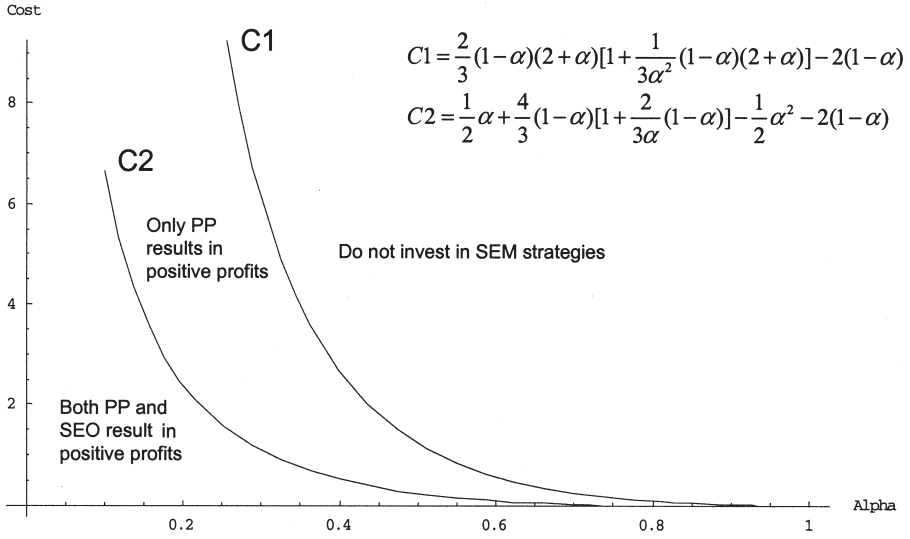
**Proposition 1:** When the cost of implementing either PP or SEO is such that  $c_i > C1$  and  $C2$  (where  $i = A, B$ ; and  $C1$  and  $C2$  are given in Figure 1), both sellers are better off not investing in any SEM strategy (see Figure 1).

		Seller A		
Seller B	No SEM	SEO	PP	
No SEM	$\Pi_A^N = \Pi_B^N$	$\Pi_A^{SEO} = \frac{1}{2}\alpha + \frac{4}{3}(1-\alpha)$	$\Pi_A^{PP} = \frac{1}{2}\alpha^2 + \frac{2}{3}(1-\alpha)(2+\alpha)$	
	$= \frac{1}{2}\alpha^2 + 2(1-\alpha)$	$\left[1 + \frac{2}{3\alpha}(1-\alpha)\right] - c$	$\left[1 + \frac{1}{3\alpha^2}(1-\alpha)(2+\alpha)\right] - c$	
		$\Pi_B^N = \frac{1}{2}\alpha + \frac{2}{3}(1-\alpha)$	$\Pi_B^N = \frac{1}{2}\alpha^2 + \frac{2}{3}(1-\alpha)(1+2\alpha)$	
		$\left[1 + \frac{1}{3\alpha}(1-\alpha)\right]$	$\left[1 + \frac{1}{3\alpha^2}(1-\alpha)(1+2\alpha)\right]$	
SEO	$\Pi_A^P = \frac{1}{2}\alpha + \frac{2}{3}(1-\alpha)$	$\Pi_A^{SEO} = \Pi_B^{SEO} = \frac{1}{2} - c$	$\Pi_A^{PP} = \frac{1}{2}\alpha + \frac{2}{3}(1-\alpha)$	
	$\left[1 + \frac{1}{3\alpha}(1-\alpha)\right]$		$\left[1 + \frac{1}{3\alpha}(1-\alpha)\right] - c$	
	$\Pi_B^{SEO} = \frac{1}{2}\alpha + \frac{4}{3}(1-\alpha)$		$\Pi_B^{SEO} = \frac{1}{2}\alpha + \frac{4}{3}(1-\alpha)$	
	$\left[1 + \frac{2}{3\alpha}(1-\alpha)\right] - c$		$\left[1 + \frac{2}{3\alpha}(1-\alpha)\right] - c$	
PP	$\Pi_A^N = \frac{1}{2}\alpha^2 + \frac{2}{3}(1-\alpha)(1+2\alpha)$	$\Pi_A^{SEO} = \frac{1}{2}\alpha + \frac{4}{3}(1-\alpha)$	$\Pi_A^{PP} = \Pi_A^{PP}$	
	$\left[1 + \frac{1}{3\alpha^2}[(1-\alpha)(1+2\alpha)]\right]$	$\left[1 + \frac{2}{3\alpha}(1-\alpha)\right] - c$	$= \frac{1}{2}[(1-\alpha)^2 + \alpha^2] + 2\alpha(1-\alpha)$	
	$\Pi_B^{PP} = \frac{1}{2}\alpha^2 + \frac{2}{3}(1-\alpha)(2+\alpha)$	$\Pi_B^{PP} = \frac{1}{2}\alpha + \frac{2}{3}(1-\alpha)$	$+ \frac{2[\alpha(1-\alpha)]^2}{[(1-\alpha)^2 + \alpha^2]} - c$	
	$\left[1 + \frac{1}{3\alpha^2}[(1-\alpha)(2+\alpha)]\right] - c$	$\left[1 + \frac{1}{3\alpha}(1-\alpha)\right] - c$		

**Table 3. Profit Functions Under SEM Strategy Choices.**

$\Pi_i^N$  = Equilibrium profit function for Seller  $i$  ( $i = A, B$ ) when no SEM strategy is used.  $\Pi_i^{SEO}$  = Equilibrium profit function for Seller  $i$  ( $i = A, B$ ) when SEO strategy is used.  $\Pi_i^{PP}$  = Equilibrium profit function for Seller  $i$  ( $i = A, B$ ) when PP strategy is used. Assume  $c_A = c_B = c$ .

For relatively higher values of  $\alpha$ , even a relatively small value  $c_i$  (where  $i = A, B$ ) could be more than C1 and C2 (see Figure 1), and therefore both sellers are better off not investing in any SEM strategy. However, for relatively low values of  $\alpha$ , sellers would only be discouraged from pursuing an SEM strategy if the cost of doing so is prohibitively high. What this means is that if both sellers are likely to be listed in the back pages of the search results (i.e., low  $\alpha$ ), their probability of being part of a buyer's consideration set is pretty low. In such a situation, they would be better off pursuing an SEM strategy even if the cost of implementing it is relatively high.



**Figure 1. Cost Constraints for SEM Implementation**

**Proposition 2:** *There exists a threshold value  $\alpha^*$  such that when  $\alpha \leq \alpha^*$  and  $c_i < C1$  and  $C2$  (where  $i = A, B$ ; and  $C1$  and  $C2$  are given in Figure 1), there exists no pure strategy Nash equilibrium SEM strategy.*

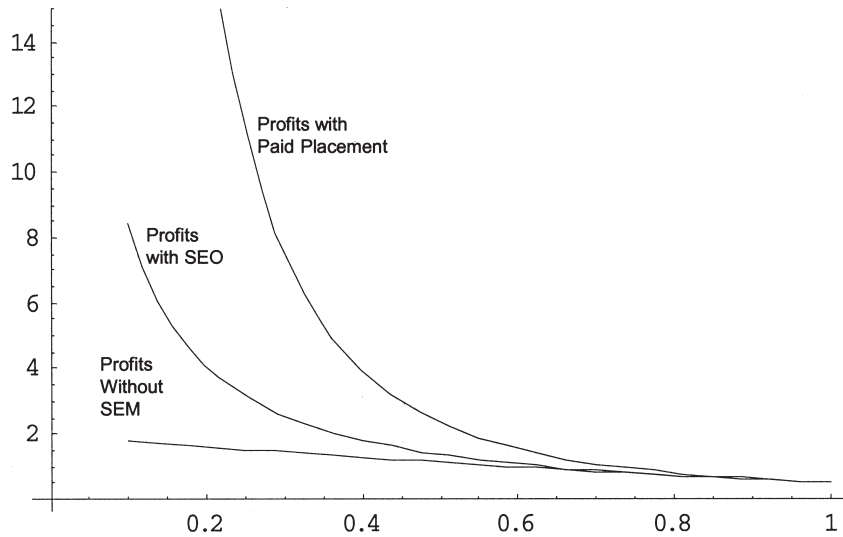
When  $c_i < C1$  and  $C2$ , let us assume without any loss of generality that Seller B decides not to invest in an SEM strategy. In response, Seller A is better off purchasing paid placement on the search engine [because  $\Pi_A^{PP} > \Pi_A^{SEO} \Pi_A^N$ ] (see Figure 2).

When Seller A decides to purchase paid placement, Seller B's best response is to implement SEO when  $\alpha \leq \alpha^*$  and to invest in paid placement when  $\alpha > \alpha^*$  (see Figure 3).

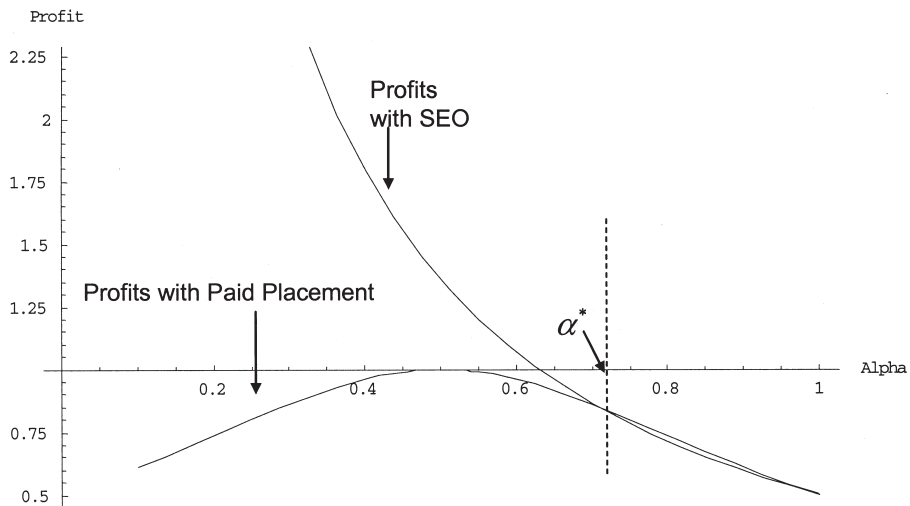
If we assume that  $\alpha \leq \alpha^*$ , then Seller B implements SEO. In response, Seller A is better off doing nothing (i.e., not investing in SEM). Seller B's reaction is to invest in PP, in which case Seller A decides to invest in SEO (because  $\alpha \leq \alpha^*$ ), and so on. In short, there is no pure strategy Nash equilibrium when  $c < C1$  and  $C2$  and  $\alpha \leq \alpha^*$ .

**Proposition 3:** *There exists a threshold value  $\alpha^*$  such that when  $\alpha > \alpha^*$  and  $c_i < C1$  and  $C2$  (where  $i = A, B$ ; and  $C1$  and  $C2$  are given in Figure 1), the Nash equilibrium is defined by both the sellers investing in paid-placement SEM strategy.*

When  $c_i < C1$  and  $C2$ , let us assume without any loss of generality that Seller B decides not to invest in an SEM strategy. Seller A's best response is to purchase paid placement on the search engine, because  $\Pi_A^{PP} > \Pi_A^{SEO} > \Pi_A^N$  (see Figure 2). In response, Seller B is better off buying paid placements (because  $\alpha > \alpha^*$ ), and we end up with equilibrium where both sellers invest in a paid-placement SEM strategy.



**Figure 2. When Seller B Has No SEM, the Strategy for Seller A's Investing in Paid Placement Weakly Dominates Its Strategy to Invest in SEO or Not Invest in SEM**



**Figure 3. When Seller A Chooses PP, Then for Seller B, SEO Dominates PP Strategy When  $\alpha \leq \alpha^*$**

	$\alpha \leq \alpha^*$	$\alpha > \alpha^*$
$c_i > C1$ and $C2$ (where $i = A, B$ )	Neither seller invests in an SEM strategy	
$c_i \leq C1$ and $C2$ (where $i = A, B$ )	No pure strategy Nash equilibrium	Both sellers buy paid placement

**Table 4. Equilibrium Outcomes.**

## Discussion

The results obtained in the preceding section are summarized in Table 4.

### *Sellers Do Not Invest in SEM Strategy*

Even though SEM is a fast-growing segment of on-line marketing, it is not the dominant form of advertising because not all on-line sellers are persuaded of its effectiveness [21]. There is a rationale for their decision not to invest in SEM strategies. The probability that a seller with no SEM strategy will be listed among the high-ranked results on the search-results page and therefore become part of a buyer's consideration set is denoted by  $\alpha$ . When  $\alpha$  is relatively high, even a low-cost SEM strategy would not justify the cost of SEM, because it would not significantly increase the probability that the sellers will be part of a buyer's consideration set. There are various scenarios where  $\alpha$  would be high. For instance,  $\alpha$  would be high when the keywords associated with it are related to only a few Web sites. Potential buyers who search using these keywords will end up with only a few search-result pages and can search through most of the search results. In such a case, the sellers are always discovered by the buyers. Another example where  $\alpha$  would be high is when potential on-line buyers have high search intensity. A buyer's search intensity depends on several factors, such as the opportunity cost of time [14, 18, 19], the perception of price dispersion [14, 15, 23, 32], the expected savings from search activity [18, 19, 22], and the importance/value of the product the buyer intends to buy. Thus potential buyers are likely to have high search intensity if they have low opportunity cost of time, or perceive high price dispersion, or are buying an expensive product. These buyers are more likely to discover on-line sellers even if they are listed in the back pages of the search results. Therefore, there is a relatively high probability that these sellers will be part of a buyer's consideration set.

To summarize, in the case of electronic markets characterized by buyers with high search intensity (e.g., buyers who enjoy on-line browsing) or by products that have relatively few relevant Web sites (e.g., vintage car sellers in and around Austin, Texas), on-line sellers would be better off not investing in SEM strategies. However, if the buyer's search intensity is low (e.g., buyers with opportunity cost of time), the product has a large number of relevant sites (e.g., computers), or the product is of low value (e.g., books),  $\alpha$  would be relatively low. In such a scenario, on-line sellers would want to invest in SEM.

However, if the cost of investing in SEM is relatively high, that is,  $c_i > C1$  and  $C2$  (see Figure 1), sellers will be discouraged from investing. Therefore, if search engines are interested in selling paid placement to these sellers, they should price the placements such that the total cost incurred by the sellers (i.e.,  $c_i$ ) is less than the threshold values  $C1$  and  $C2$ . If the paid placements are being auctioned (as is usually the case), the search engine should not expect the total revenues to exceed  $2c$ , where  $c \leq C1$  and  $C2$ .

### ***Sellers Buy Paid Placements***

This equilibrium occurs when the total cost of SEM is less than  $C1$  and  $C2$  and  $\alpha > \alpha^*$  (see Figure 3). This is an interesting result in light of the fact that when the total cost of SEM is greater than  $C1$  and  $C2$  (see Figure 1), a high-value  $\alpha$  discourages sellers from investing in SEM strategies. There are two ways to explain why a seller would invest in paid placement even when  $\alpha > \alpha^*$ . One is that the total cost of paid placements is so low that even a small increase in profitability justifies the investment. The other is that even with a high  $\alpha$ , it is still probable that none of the sellers will appear in the editorial section, in which case a potential buyer browses the sponsored links [8]. If a seller buys paid placements, then it can benefit from this demand. Furthermore, the seller who buys paid placement has monopoly demand when the competing seller does not show up in the editorial listings. Because this is a symmetric game, both sellers think along the same lines and end up purchasing paid placement even when  $\alpha$  is relatively high.

### ***Why Is SEO Never Part of an Equilibrium Strategy?***

This is another interesting result of the analysis. Even when implementing SEO costs the same as investing in paid placements, and the benefits include the assurance of always being part of a buyer's consideration set, SEO is still not the optimal SEM strategy for both sellers. The intuitive explanation is that when  $\alpha$  is high, any investment in SEO is redundant, because the likelihood of being listed in the top search results is high enough to start with. For a low  $\alpha$ , the sellers will not be listed in the editorial section most of the time, in which case the buyers will visit the sponsored links. In such a scenario, investing in paid placements makes economic sense. In addition, if it is assumed that SEO costs more than PP [13], then PP becomes much more attractive than SEO. Therefore, it should not be surprising that SEO is not a part of the optimal SEM strategy. This outcome is supported by the distribution of SEM dollars, which is biased toward paid-placement investments, and by the fact that the Web sites of fewer than 10 percent of the *Fortune Magazine* top 100 companies used SEO as part of their SEM strategy [7].

### ***Concerns About Paid Placements***

Although paid placement is the equilibrium outcome under certain conditions, there is a serious concern about its misuse. Most paid placements are

charged on the basis of click-through rates, which can be artificially increased by using automatic software or manually [3, 24, 33]. The strategy of artificially increasing the click-through rate can be employed by search engine affiliates to improve their revenues from contextual advertising. It can also be used by unscrupulous competitors who want to drain the advertising dollars of paid-placement buyers. Fortunately, paid-placement buyers can minimize the risk of paying extra for fraudulent clicks by using click-fraud prevention software tools. Click Auditor, for instance, would allow them to (a) identify whether the repeated click-throughs are being generated from suspicious Internet protocol (IP) addresses (e.g., there is something wrong if the clicks originate from a competitor's IP address); (b) identify the geographic location of the clicker, which is especially important if all the sales come from one area (e.g., country) while a huge volume of clicks originates from another country; and (c) monitor keywords with unusual click activity or with declining conversion rates, which can be good indicators of fraud.<sup>2</sup> In addition, search engines have begun to compensate victims (i.e., buyers of paid placements) for any payments made as a result of fraudulent clicks [3].

## Conclusion

On-line searching is an integral activity of most on-line buyers, and search engines are the most popular tools for this purpose. As a result, search listings have become a noninvasive, "pull marketing" strategy that works in the background. Sellers are keen to advertise and promote themselves on search engines. Initial attempts like banner ads, pop-ups, and e-mail marketing promotions use a frustrating push marketing strategy that interrupts the user's self-directed search. The effectiveness of these methods in terms of click-throughs has gone down from about 2 percent to less than 0.5 percent in recent years, and on-line sellers now realize that banner advertisements do not bring the traffic volume they want. Conversely, paid placements on search engine results pages are unobtrusive, more effective than banner ads and pop-ups, and a cost-effective way to reach buyers.

The main argument against paid placement is that most buyers do not trust paid placements and prefer to follow links displayed in the editorial section of the search-results pages [9]. Given the bias toward editorial content in buyers' on-line search behavior, one could argue that, instead of investing in paid placements, on-line sellers should undertake search engine optimizations (SEOs) to improve their rank in the search-result listings. This paper shows that even if the total cost of implementing SEO and implementing paid placement was the same, and SEO always resulted in a high ranking on the search-results page, paid placement would still prevail as the SEM strategy of choice for most on-line sellers. This result can help advertising professionals who have to justify investments in paid placements even when there is overwhelming evidence that most buyers ignore paid placements and follow links displayed in the editorial section of the search-results page.

The analysis will provide search engine vendors with insights about the attractiveness of various SEM strategies for on-line sellers, and will help on-

line sellers to identify their optimal SEM strategy and recognize the conditions under which one strategy is better than the other. Like any analytical model, the proposed model has certain limitations inherent in its simplicity and its underlying assumptions. However, the model is realistic enough to provide a better understanding of the issue and an economic rationale for the most popular SEM strategy currently employed by most on-line sellers—purchasing paid placements in the sponsored section of the search-results page.

## NOTES

1.  $c_i$  is equal to (a) zero when the SEM strategy consists of doing nothing, (b)  $c$  when the SEM strategy consists of either SEO or PP, and (c)  $2c$  when the SEM strategy consists of both SEO and PP.
2. For more on Click Auditor, go to [www.keywordmax.com/click\\_auditor.html](http://www.keywordmax.com/click_auditor.html).

## REFERENCES

1. Bruemmer, P. Sea change in search engine marketing. Search Engine Guide, October 17, 2002 ([www.searchengineguide.com/wi/2002/1017\\_wi1.html](http://www.searchengineguide.com/wi/2002/1017_wi1.html), accessed February 22, 2005).
2. Dahlen, M. Banner advertisements through a new lens. *Journal of Advertising Research*, 41, 4 (July/August 2001), 23–30.
3. Delaney, K. J. In "click fraud," Web outfits have a costly problem. *Wall Street Journal*, April 6, 2005, A1.
4. Dou, W.; Linn, R.; and Yang, S. How smart are "smart banners"? *Journal of Advertising Research*, 41, 4 (2001), 31–43.
5. Edwards, S. M.; Lee, J.; and Li, H. Forced exposure and psychological reactance: Antecedents and consequences of the perceived intrusiveness of pop-up ads. *Journal of Advertising*, 31, 3 (September 2002), 83–95.
6. Fundenberg, D., and Tirole, J. *Game Theory*. Cambridge, MA: MIT Press, 2000.
7. Global leaders risk losing market share. One Up Web: White Papers, 2004 ([www.oneupWeb.com/search-marketing-results/fortune100.htm](http://www.oneupWeb.com/search-marketing-results/fortune100.htm), accessed February 22, 2005).
8. Hansell, S. Paid placement is catching on in Web searches. *New York Times*, June 4, 2001.
9. Hotchkiss, G. In the mind of the searcher. White Paper, Enquiro, 2003–2004 ([www.enquiro.com/research.asp](http://www.enquiro.com/research.asp)).
10. Hotchkiss, G.; Jensen, S.; Jasra, M.; and Wilson, D. The role of search in business to business buying decisions: A summary of research conducted. White Paper, Enquiro, October 27, 2004 ([www.sempo.org/research/Enquiro\\_B2B\\_Survey.pdf](http://www.sempo.org/research/Enquiro_B2B_Survey.pdf), accessed February 22, 2005).
11. Hotelling, H. Stability in competition. *Economic Journal*, 39 (1929), 41–57.
12. iProspect Search Engine User Attitude. White Paper, iProspect, April–May 2004 ([www.iProspect.com](http://www.iProspect.com), accessed February 22, 2005).
13. Jarboe, G. Why does search engine marketing look like a penny-farthing bicycle? Internet Search Engine Database, January 11, 2005 ([www.isedb.com/news/article/1086/](http://www.isedb.com/news/article/1086/), accessed February 22, 2005).

14. Manning, R., and Morgan, P. Search and consumer theory. *Review of Economic Studies*, 49, 2 (1982), 203–216.
15. Marvel, H.P. The economics of information and retail gasoline price behavior: An empirical analysis. *Journal of Political Economy*, 84 (1976), 1003–1059.
16. Novak, T., and Hoffman, D. Advertising pricing models for the World Wide Web. In D. Hurley, B. Kahin, and H. Varian (eds.), *Internet Publishing and Beyond: The Economics of Digital Information and Intellectual Property*. Cambridge, MA: MIT Press, (2000), pp. 55–61.
17. Rashtchy, S. New methods in search marketing: Contextual advertising and other evolutions. Paper presented at Best Practices for Marketing and Optimizing Your Search Engine Process, La Jolla, CA, June 15–16, 2004 ([www.sempo.org/research/Rashtchy-Presentation.pdf](http://www.sempo.org/research/Rashtchy-Presentation.pdf)).
18. Ratchford, B., and Srinivasan, N. An empirical investigation of returns to search. *Marketing Science*, 12, 1 (winter 1993), 73–87.
19. Ratchford, B., and Srinivasan, N. An empirical test of a model of external search for automobile. *Journal of Consumer Research*, 18, 2 (September 1993), 233–242.
20. Shandasani, P.N.; Stanaland, A.J.; and Tan, J. Location, location, location: Insights for advertising placement on the Web. *Journal of Advertising Research*, 41 (July 2001), 7–21.
21. Shen, F. Banner advertisement pricing, measurement, and pretesting practices: Perspectives from interactive agencies. *Journal of Advertising*, 31, 3 (2002), 59–67.
22. The State of Search Engine Marketing 2004. White Paper, SEMPO, December 2004 ([www.sempo.org/research/sem-trends-2004.php](http://www.sempo.org/research/sem-trends-2004.php), accessed February 22, 2005).
23. Stigler, G.J. The economics of information. *Journal of Political Economy*, 69, 3 (June 1961), 213–225.
24. Stricchiola, J.C. Click fraud: An overview. White Paper, Alchemist Media ([www.alchemistmedia.com/CPC\\_Click\\_Fraud.htm](http://www.alchemistmedia.com/CPC_Click_Fraud.htm), accessed February 22, 2005).
25. Sullivan, D. Buying your way in to search engines. SearchEngineWatch, June 29, 2002 (<http://searchenginewatch.com/Webmasters/paid.html>, accessed February 22, 2005).
26. Sullivan, D. LookSmart changes to cost-per-click listings. Search Engine Report, May 6, 2002 (<http://searchenginewatch.com/sereport/02/05-looksmart.html>, accessed February 22, 2005).
27. Sullivan, D. Monetizing the search. Search Engine Report, September 4, 2000 (<http://searchenginewatch.com/sereport/00/09-money.html>, accessed February 22, 2005).
28. Sullivan, D. Pay for placement? SearchEngineWatch, November 15, 2002 (<http://searchenginewatch.com/resources/paid-listings.html>, accessed February 22, 2005).
29. Sullivan, D. The bumpy road to maximum monetization. Search Engine Report, March 6, 2002 (<http://searchenginewatch.com/sereport/02/05-money.html>, accessed February 22, 2005).
30. Sullivan, D. The mixed message of paid inclusion. Search Engine Report,

May 6, 2002 (<http://searchenginewatch.com/sereport/02/05-inclusion.html>, accessed February 22, 2005).

31. Tirole, J. *The Theory of Industrial Organization*. Cambridge, MA: MIT Press, 1988.

32. Urbany, J.E.; Dickson, P.R.; and Kalapurakal, R. Price search in the retail grocery market. *Journal of Marketing*, 60 (April 1996), 91–104.

33. Vidyasagar, N. India's secret army of on-line ad "clickers." Times News Network, May 3, 2004 (<http://timesofindia.indiatimes.com/articleshow/msid-654822,curpg-1.cms>, accessed February 22, 2005).

34. What is SEO? High Search Engine Ranking ([www.high-search-engine-ranking.com/what\\_is\\_SEO.htm](http://www.high-search-engine-ranking.com/what_is_SEO.htm), accessed February 22, 2005).

RAVI SEN (rsen@cgsb.tamu.edu) is an assistant professor at Mays Business School, Texas A&M University. His research interests include economics of e-commerce, economics of information, and open-source software. He has published in *International Journal of Electronic Commerce* and *Electronic Markets*.

Copyright of International Journal of Electronic Commerce is the property of M.E. Sharpe Inc.. The copyright in an individual article may be maintained by the author in certain cases. Content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.