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# Contingent Processes of Source Identification

MICHEL TUAN PHAM  
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Effective communication requires that consumers attribute the message content to its intended source. The proposed framework distinguishes four types of source identification processes—cued retrieval, memory-trace refreshment, schematic inferencing, and pure guessing—and delineates their contingencies. Two experiments examine portions of the framework, and experiment 2 introduces a new methodology for decomposing multiple processes. Findings suggest that when cued retrieval fails, consumers try to refresh the original memory trace for the learning episode—a process that is effortful. They invoke schematic inferencing only if the original memory trace cannot be refreshed. Reliance on cued retrieval seems to require little processing capacity. If there is some motivation for accuracy, pure guessing appears to be invoked only as a last resort.

The purpose of marketing communication—whether television advertising, sales promotion, or event sponsorship—is, broadly speaking, to convey something good (or bad) about someone. Effective marketing communication thus requires that (a) consumers remember and value the message content, and (b) they attribute the message content to its intended source (e.g., brand, company, political candidate). Consumer researchers and marketing practitioners have essentially focused on the first condition; the second has been largely overlooked.

Consider, for instance, Coca-Cola's attempt to use the 1996 Olympics to enhance the value of its brands. The company paid the International Olympic Committee \$40 million for the right to be an official sponsor of the games and spent another half a billion dollars to advertise Coke's association with the event. Yet, during prior Olympics where Coca-Cola was an official sponsor, only 12 percent of American adults correctly identified Coca-Cola as an Olympic sponsor, and 5 percent incorrectly named Pepsi (Collins 1996). The likelihood of sponsor nonidentification or misidentification can be high, especially when competitors make deliberate attempts to confuse consum-

ers about who are the actual sponsors, a practice known as "ambush marketing" (Meenaghan 1994; Sandler and Shani 1989; see also Reilly 1996).

Source (mis)identification is also critical in traditional advertising settings. In a recent commercial study conducted in the Netherlands (*Nieuwsribune* 1993), consumers were asked to identify the brands of beer (e.g., Heineken, Amstel) that were associated with different advertising slogans. Source misidentification averaged 20 percent; 39 percent of the consumers, for instance, mistakenly attributed Amstel's slogan to other brands. Realizing the importance of this phenomenon, advertising research firms such as Millward Brown International have developed copy-testing methodologies that explicitly assess how well the message content is linked to the advertised brand.

The issue of source identification (and misidentification) has become increasingly important across various forms of marketing communication. It is now clear that message content and source often become dissociated in today's communication environment. Reasons include the clutter of messages, the limited processing resources that consumers generally allocate to these messages (see, e.g., Hawkins and Hoch 1992; Pham 1996), and the usual temporal separation of message exposure and decision-making episodes (see, e.g., Baker and Lutz 1988).

Given that there is a potential for source dissociation, what are the processes that consumers use to identify the source of marketing communication messages? How does a consumer remember which brand made a particular advertising claim? How does a consumer remember which store recently advertised that it was holding a sale this weekend? How does a consumer remember that it was Coca-Cola, and not Pepsi, who was the official sponsor of the Atlanta Olympics?

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Our framework identifies four types of source identification processes: (1) semantic cued retrieval, (2) memory-trace refreshment, (3) schematic inferencing, and (4) pure guessing. We argue that these processes are used in a contingent manner and test some aspects of these contingencies in two experiments. Experiment 1 focuses on memory-trace refreshment and schematic inferencing and examines how reliance on each of the two processes varies over time. Experiment 2 assesses how all four processes are used over time and how much processing capacity they require. In this second experiment, we introduce a new methodology for disentangling multiple processes such as those of source identification.

## PROCESSES OF SOURCE IDENTIFICATION

Two memory frameworks—associative network and source monitoring—provide complementary insights into the processes that consumers may use to identify the source of marketing communication messages.

### Source Identification as Semantic Cued Retrieval

Associative network models of memory (see, e.g., Anderson and Bower 1973; Collins and Loftus 1975) focus on how meaningful information is stored and subsequently retrieved and generally assume that perceptual and contextual information is quickly forgotten (see, e.g., Anderson 1990). According to these models, consumers exposed to marketing communications may store the message content (e.g., an advertising claim or a promotional offer) and its source (e.g., a brand or a store name) as distinct nodes in their semantic memory networks (see, e.g., Hutchinson and Moore 1984; Keller 1987). The content and source nodes are connected by a link, whose strength depends on encoding factors such as how well the ad copy associates the message content with the source and how often this association is repeated (see, e.g., Burke and Srull 1988). Within an associative network framework, the process of source identification can be conceptualized as a form of semantic cued retrieval.

Consider a consumer who has to identify which brand of car claims to be “the ultimate driving machine.” Thinking about the claim “the ultimate driving machine” would activate a node representing this claim in long-term memory, and the activation would then spread to associated nodes. If the spreading activation reaching the source node “BMW” is strong enough, the brand’s name would enter into the consumer’s working memory; s/he would then recall BMW as being the source of the claim.

The probability of source identification through cued retrieval depends essentially on two types of factors. It depends on the strength of the semantic link between source and content that is formed at encoding, and it depends on the overlap between cues that are available at retrieval, and the to-be-recalled source material (see Burke and Srull [1988] and Keller [1987] for related

discussions). What if the strength of the link is not particularly strong or the cue not sufficiently potent?

Some models of paired-associate learning postulate that when people fail to retrieve an association, they make a random guess (see, e.g., Bower 1962; Murdock 1970). This raises the possibility that source identification of marketing communications is also sometimes based on pure guessing. One could hypothesize that whenever source information does not quickly “pop up” (i.e., when cued retrieval fails), consumers simply guess the source of a message. We argue that consumers do not typically resort to pure guessing when motivated to be reasonably accurate. They rely on two other processes discussed below.

### Source Identification as Source Monitoring

Judgments about the origin of information such as who provided the information and where, when, and how it was provided have been examined within the source-monitoring framework (see, e.g., Johnson 1988a, 1988b; Lindsay, Johnson, and Kwon 1991). Source monitoring is defined as “the set of processes involved in making attributions about the origins of memories, knowledge, and beliefs” (Johnson, Hashtroudi, and Lindsay 1993, p. 3). It enables people to weigh their beliefs and opinions according to the perceived credibility of the source (cf. Johar 1996). For example, consumers may associate different credence to product-related memories, depending on whether they identify these memories as originating from advertisements or from *Consumer Reports*. Trying to identify the source of a message can therefore be viewed as a source-monitoring task.

Recent theories of memory (see, e.g., Hintzman 1986) consider the possibility that memory traces for the learning episode may be richer in terms of perceptual and contextual details than is typically assumed in associative network models (see, e.g., Anderson and Bower 1973; Collins and Loftus 1975). The source-monitoring framework (see, e.g., Johnson et al. 1993) capitalizes on the contextual and perceptual richness of these episodic traces. The framework suggests that when such traces are retrieved, the contextual and perceptual details are often revealing of the sources of memories (see, e.g., Johnson and Raye 1981). These details can therefore be the basis of source identification judgments. For instance, to identify whether it was Jane or John who made a given statement, one can access one’s memory record for the statement and infer from sensory characteristics of this record (e.g., the voice pitch) that it was one rather than the other. Contextual and perceptual details also help identify whether memory traces were produced by external events or internally generated by imagination or dreaming (Johnson and Raye 1981). Memory records of external events contain more spatial, temporal, and sensory attributes, whereas internally generated memories are more schematic, less detailed, and more likely to contain records of cognitive operations (Alba 1984).

We propose that when the message content does not

quickly bring to mind its associated source, that is, when cued retrieval fails, consumers attempt to access their perceptual memory record for the original learning episode. In other words, they try to recollect the message source in the way that it was originally perceived. For example, consumers trying to remember which airline sponsored the 1996 Atlanta Olympics may mentally picture the commercials broadcasting the sponsorship and "see" that it was Delta. Similarly, a consumer trying to remember which store was having a sale may try to bring to mind the specific newspaper ad in which s/he read about the sale. We call this process "memory-trace refreshment." It entails an attempt to revive (bring to consciousness) the original learning episode with its perceptual and contextual details.

The source-monitoring framework suggests that source identification may also involve more strategic processes, distinct from sheer inspection of characteristics of the memory trace (Johnson et al. 1988, 1993). These reasoning processes involve retrieval of supporting memories that are part of the individual's general declarative knowledge. For example, to determine whether it was Jane or John who made a given statement, people who are unable to recollect the original episode may rely on their general schema about each person (e.g., "Only John could have made that off-color joke!").

We suggest that consumers may rely on similar reasoning processes to identify the source of a message. They may draw source inferences based on the message content and their general knowledge (or schemas) about potential sources. These inferences help them assess the plausibility of the association between the content and alternative sources, without necessitating a recollection of the learning episode. We call this mode of source identification "schematic inferencing." For instance, consumers trying to remember which airline sponsored the 1996 Atlanta Olympics may capitalize on their general declarative knowledge about airlines and infer that "It must be Delta because this airline is based in Atlanta." Of course, using such reasoning processes might also be prone to error due to the inferential leap(s) involved in generating judgments this way and to the inaccuracies often associated with theory-based judgments (see, e.g., Broniarczyk and Alba 1994; Johar 1995). Nevertheless, the strategic use of one's general knowledge clearly differentiates this process from pure guessing.

In summary, there may be more to the recollection of a message source than sheer cued retrieval (Johnson et al. 1993), especially if the link between the source and the message content is weakly encoded. In addition to pure guessing, source identification of marketing communications may also be based on memory-trace refreshment and schematic inferencing. We elaborate next on the contingencies surrounding the different processes.

### Process Contingencies

When there has been strong encoding of the message-source association—for instance, through frequent repeti-

tions or high elaboration—semantic cued retrieval is likely to be the dominant process of source identification. It is well documented that with proper cues, the retrieval of well-formed associations is almost instantaneous and nearly effortless (see, e.g., Anderson 1990; Baddeley 1990; Moscovitch 1994). Given that spreading activation is an efficient mechanism of internal search (see, e.g., Anderson 1983), we speculate that in source identification consumers first rely on whether the message content promptly "brings to mind" the associated source. However, if cued retrieval fails, other processes need to be invoked (see Fig. 1).

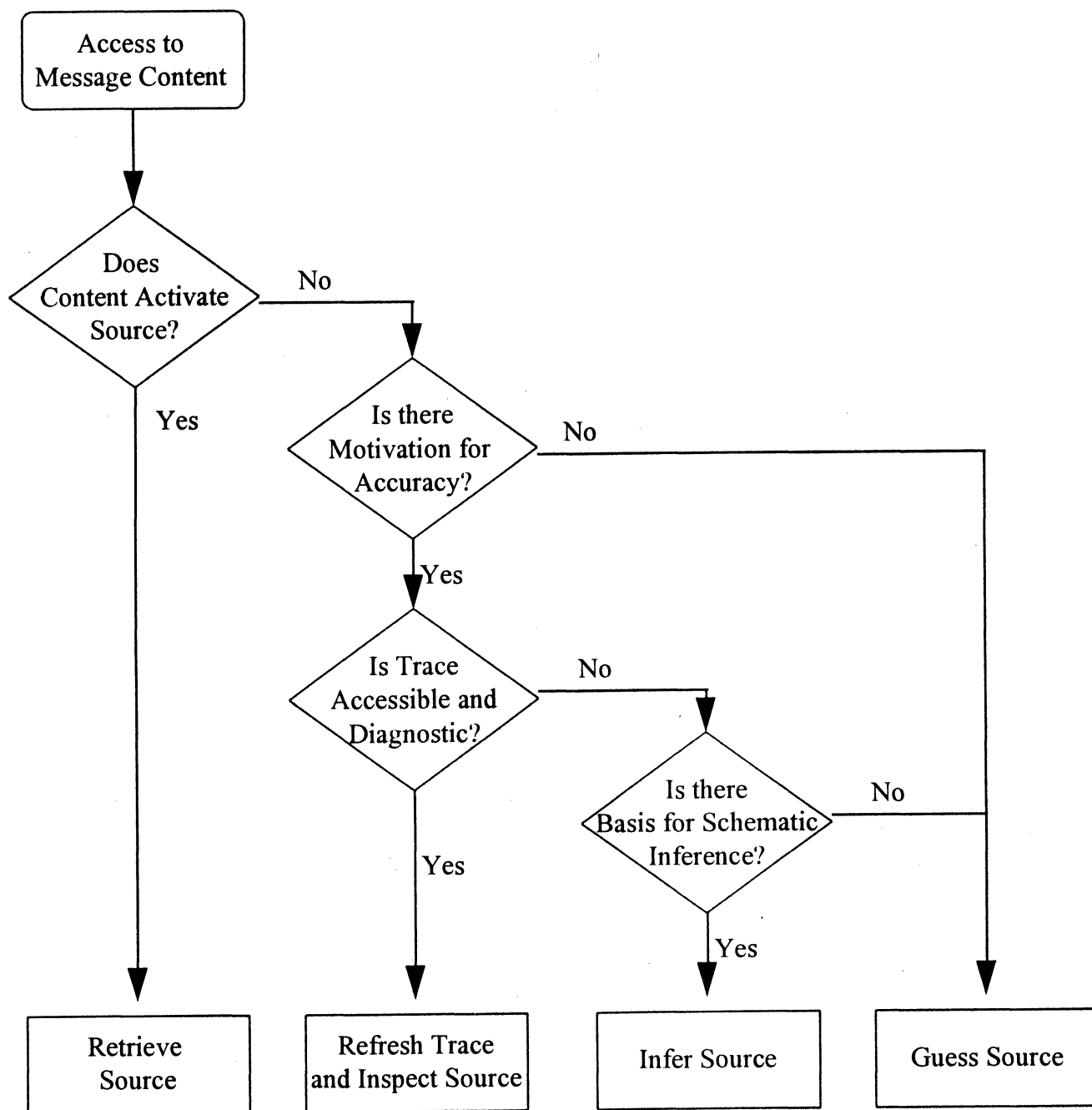
The process that will be followed depends on whether the consumer is at least somewhat motivated to make an accurate source identification. In those instances in which this motivation is completely lacking, the consumer is likely to rely on pure (random) guessing. Although this situation may occur in a laboratory setting (e.g., careless and/or unmotivated subjects), it is probably uncommon in real life.

It is reasonable to assume that consumers often have an intrinsic motivation to be reasonably accurate, especially when source identification is instrumental to their decisions (e.g., "I really want that purple suit. Where did I see it?"). We propose that in the absence of cued retrieval, consumers would feel more confident in their source identification judgments if these could be based on the memory trace for the original learning episode (e.g., "I clearly remember seeing it in that store"). Such traces are perceived to be more valid representations of external reality than constructed inferences (see Johnson and Raye [1981] for a related discussion). Therefore, consumers should have a tendency to first try to refresh their memory traces for the original learning episode before initiating a schematic inference. Whenever these episodic traces are accessible, they should be a more important determinant of consumers' source identification judgments than schematic inferences.

However, as the trace for the learning episode loses some of its perceptual and contextual details over time (see, e.g., Barclay 1986), source identification through trace refreshment should become increasingly difficult. We suggest that when consumers are unable to refresh the original trace, they *then* resort to schematic inferencing to make their source identification judgments. In other words, reliance on schematic inferencing should be contingent on one's inability to refresh the original trace. We refer to this contingency as the "transition hypothesis."<sup>1</sup>

<sup>1</sup>Although we discuss memory-trace refreshment and schematic inferencing as though they were independent, there is a theoretical possibility that these two processes interact (see, e.g., Johnson et al. 1993). Over time, some episodic perceptual information (e.g., a friend's voice pitch) is likely to become part of a person's general knowledge. Source identification may then involve a combination of perceptual episodic information (e.g., perceptual record of a conversation), which is checked against one's general knowledge (e.g., long-term knowledge about the friend's voice). This type of process interaction is less likely in domains where the learning episode is not repeated (i.e., incidental exposure to an ad or to a store display).

**FIGURE 1**  
A MODEL OF SOURCE IDENTIFICATION



Schematic inferencing requires some basis for making the inference. Consumers must have some general knowledge about potential corporate sources, such as the types of products they make, their positioning, or their typical customer. There may be instances in which consumers do not have any basis for inferring the source. For example, the message content may pertain to a product category to which the consumer is completely new (e.g., new par-

ents shopping for infant products) or the consumer may be in a foreign market. Such situations should increase the likelihood of pure guessing.

In summary, our framework distinguishes four types of source identification processes and speculates on their contingencies. Cued retrieval may be the default process when there has been strong encoding of the association between the message content and its source. When cued

retrieval fails, consumers who are motivated to be somewhat accurate first try to refresh their memory trace for the learning episode. Should this trace be inaccessible or nondiagnostic, they then try to make a schematic inference. Should making an inference not be feasible, consumers rely on pure guessing. Pure guessing is also likely when motivation for source identification accuracy is very low.

## PILOT STUDY

The purpose of this study was to demonstrate that, in the context of our experiments (to be further described later), memory for the association between an advertising claim and its source may be poor, even though memory for the claim and the source themselves is resilient.

### Method

Twenty-four students participated in the study during a regularly scheduled class session. They were given a booklet containing nine print ads (one practice and eight target ads) and instructed not to open the booklet until asked to do so. The study was purportedly about advertising and promotions. Subjects were told that they would be given 20 seconds to read each ad and that their task was to understand the ad claims. After seeing a practice ad for 20 seconds, subjects were exposed for 20 seconds to each of the eight target ads. The ads were in black-and-white and advertised two fictitious grocery stores (four ads for each store). Each ad featured (1) a promotional claim, (2) a picture of the store with its name, and (3) other execution elements (e.g., a picture of a couple). For each store, the four ads were identical (except for featuring different claims), but the layouts were different for the two stores.

Two days later, memory for the ads was tested with three measures. First, recognition memory for the eight individual claims was tested by embedding these claims among eight foils not shown during ad exposure, and subjects were asked to make a check mark by the claims they had actually been exposed to. Second, recognition memory for the store names was tested in a similar way by embedding the two target store names among two other store names. Finally, on a separate page, subjects were given the eight claims they had seen and were asked to match the claims with the two target stores (whose names were also given).

### Results

Recognition accuracy for the individual claims (14.25 correct out of 16 targets and foils; seven correct out of eight actually seen) and the store names (3.5 correct out of four targets and foils; 1.83 correct out of two targets) was nearly perfect. However, matching of the stores with the claims was at near-chance level ( $\bar{X} = 3.5$  out of eight matches). Therefore, although memory for the individual store names and claims was resilient, ability to identify

which store was associated with each claim was poor. This finding illustrates that in settings where message-source associations are exposed only once and learned incidentally, cued retrieval of the source is likely to fail. This shows the importance of understanding other processes of source identification such as trace refreshment and schematic inferencing.

## EXPERIMENT 1

This experiment examines source identification processes in the context of advertisements for two fictitious grocery stores. As in the pilot study, it was expected that the message-source (store) associations would not be strongly encoded and that cued retrieval would therefore prove difficult. The purpose of the study was to demonstrate that, under these conditions, source identification involves two distinct processes (aside from pure guessing): memory-trace refreshment and schematic inferencing. The experiment also tests the transition hypothesis that if cued retrieval fails, consumers rely next on trace refreshment and invoke schematic inferencing only when the trace is inaccessible or nondiagnostic.

The defining characteristic of trace refreshment is that consumers attempt to revive the trace for the original learning episode with its perceptual and contextual details. They do not search for a semantic abstraction of the learned information as in cued retrieval. One way of testing this proposition is to manipulate the diagnosticity of the perceptual and contextual details contained in the original trace and assess their influence on source identification accuracy. To the extent that such details, when diagnostic, enhance source identification accuracy, one can infer that the memory trace for the original learning episode was indeed invoked for making the source judgments. We manipulated the diagnosticity of the perceptual and contextual details contained in the trace by varying the perceptual similarity between ads associated with the two stores. We reasoned that if the ads were perceptually dissimilar (e.g., different colors and layouts), refreshing the memory trace for these ads should provide useful perceptual cues for identifying the sources (i.e., it should be diagnostic). Use of the memory-trace refreshment process should therefore produce higher source identification accuracy in the dissimilar-ads condition than in the similar-ads condition, resulting in a main effect of similarity.

We argue that when retrieval fails, consumers may also rely on schematic inferencing. Consumers' general knowledge about stores usually assumes a consistency between a store's image and that of its offerings (e.g., Saks Fifth Avenue must sell Armani suits and Chanel perfumes). During source identification, a likely inference would be that a claim with an upscale (downscale) appeal probably comes from a store with an upscale (downscale) image. Therefore, one way of assessing schematic inferencing is to manipulate the plausibility of the pairings between claims with upscale/downscale appeals and stores with an upscale/downscale image. Use of a schematic inferencing process should increase source

identification accuracy when the pairings are plausible (image-consistent) and decrease it when the pairings are implausible (image-inconsistent). Reliance on schematic inferencing would thus be revealed by a main effect for plausibility.

Finally, the transition hypothesis predicts that schematic inferencing is contingent upon consumers being unable to refresh the memory trace for the original learning episode. This hypothesis can be tested by manipulating the accessibility of the memory trace for the learning episode and showing that schematic inferencing is more likely to be used under conditions of low (vs. high) trace accessibility. This experiment manipulates the accessibility of the memory trace for the learning episode by varying the delay between ad exposure and source identification (see, e.g., Hannah and Sternthal 1984). If the accessibility of the memory trace decreases over time, the likelihood of memory-trace refreshment should be lower after a long delay than after a short delay, whereas the likelihood of schematic inferencing should be higher after a long delay than after a short delay. The transition hypothesis therefore predicts an interaction between similarity and time delay (i.e., a strong main effect of similarity at time 1 but a weak effect at time 2) and an interaction between plausibility and time delay (i.e., a strong main effect of plausibility at time 2 but a weak effect at time 1). Cued retrieval and pure guessing should contribute mostly to the error term rather than to the model's estimates because these processes should be less sensitive to the experimental manipulations.

## Subjects and Design

Ninety-two business students participated in the experiment. They were exposed to eight print ads for two fictitious grocery stores (four ads for each store; see Pilot Study) and were later asked to match the claims featured in each ad with the correct store. Three factors—similarity, plausibility, and time delay—were manipulated in a  $2 \times 2 \times 2$  mixed design. The perceptual similarity between the ads for the two stores (similar vs. dissimilar) was manipulated between subjects. The plausibility of the pairings between the claims and the stores (plausible vs. implausible) was manipulated within subjects. Delay between the ad exposure episode and the source identification episode (five minutes vs. one hour) was manipulated such that subjects were tested on different items in the two (within-subject) delay conditions. The analysis of matching accuracy (across claims) is conducted treating delay as a within-subjects variable. This is because overall accuracy (rather than accuracy in specific claims) allows us to infer the process used in source judgments.

## Manipulations

**Similarity.** To manipulate the perceptual similarity between the ads for the two stores, we varied the color of the ads, the store building, the background, and the look and position of the featured couple. It is well accepted that

similarity between two objects is a positive function of their shared features and a negative function of their distinct features (Tversky 1977). In the similar condition, the ads for the two stores shared a similar layout and a similar color scheme. In the dissimilar condition, the ads for the two stores were distinct both in terms of layout and in terms of color scheme.

This manipulation was pretested among 22 subjects. They were exposed for 20 seconds to each of 12 ads. Half of the subjects were exposed to the similar version of the ads, and the other half were exposed to the dissimilar version. As a manipulation check, they were asked to picture the ads for the two stores in their mind and to report—on a seven-point scale anchored by “extremely easy” and “extremely difficult”—how easy it was to tell ads for the two stores apart. Subjects in the similar condition found it more difficult to tell the ads apart than did subjects in the dissimilar condition ( $\bar{X} = 4.80$  vs.  $\bar{X} = 3.18$ ;  $F(1, 19) = 4.12$ ,  $p = .05$ ). As a confounding check, subjects also rated the amount of attention that they paid to the ads for each of the two stores on a 1 (“very little”) to 7 (“a lot”) scale. Self-reported amount of attention to the ads was almost identical in the two similarity conditions ( $F$ 's  $< 1$ ). Therefore, the similarity manipulation did not draw differential attention to the ads for a particular store.

**Plausibility.** This factor was manipulated by varying the consistency between the image conveyed by each store's name and the image conveyed by each claim. Two pretests were conducted to assess the image of hypothetical store names and to measure the perceived likelihood that various claims would be made at each store. Hypothetical store names were used to control for variance in subjects' prior beliefs regarding real stores.

In pretest 1, 36 students assessed the images conveyed by four store names on seven-point scales anchored by “downscale” (1) and “upscale” (7). Matched  $t$ -tests revealed that the names “Food Village Market” and “Bargain Supermarket” conveyed significantly different images ( $\bar{X} = 4.75$  vs.  $\bar{X} = 2.19$ ;  $t(35) = 10.48$ ,  $p < .01$ ). Further, both stores were considered to be equally likely as names of supermarkets ( $\bar{X} = 5.52$  vs.  $\bar{X} = 5.69$ ;  $t(35) = .50$ ,  $p > .5$ ). These two store names were therefore selected.

In pretest 2, 22 subjects were asked to rate the likelihood that each of 26 claims would be made by one of the stores. Half of the subjects responded with respect to Bargain Supermarket; the other half responded with respect to Food Village Market. They used seven-point scales anchored by “not at all likely” and “extremely likely.” Eight claims were selected for further testing because four of them were found to be more likely at Food Village Market than at Bargain Supermarket (e.g., “Mix your own blend of coffee at our store”;  $p$ 's  $< .1$ ), and four of them were found to be more likely at Bargain Supermarket than at Food Village Market (e.g., “Private label, generic orange juice available at our store”;  $p$ 's  $< .1$ ).

*Delay.* The eight source identification questions were grouped into two sets of four questions each; the first set was tested at time 1, and the second set was tested at time 2. Two questions in each set pertained to plausible pairings and two pertained to implausible pairings. One claim was plausible for Food Village Market and one was plausible for Bargain Supermarket. Similarly, one claim was implausible for Food Village Market and one was implausible for Bargain Supermarket. The ordering of the two groups of four questions was counterbalanced across subjects so that half the subjects were tested on one set (set A) after a short (five-minute) delay and tested on the other set (set B) after a longer (one-hour) delay. The other half were tested on set B after a short delay and on set A after a longer delay. Thus, each subject was tested on different items in the two (within-subject) delay conditions.

*Other Controls.* As detailed in Appendix A, there were eight different stimuli sets, four in each similarity condition. Two sets in each condition counterbalanced the pairing of the claim and the store so that the same claim served as plausible or as implausible. For example, in one set (e.g., set 3 in App. A) the claim "Mix your own blend of coffee at our store" (claim 7) was paired with Food Village Market, making it a plausible claim, and in another set (e.g., set 1 in App. A) it was paired with Bargain Supermarket, making it an implausible claim. The pairing of the ad layout (e.g., how the store building appears in the ad) with the store name was also counterbalanced so that the same layout was paired with Bargain Supermarket in one set and with Food Village Market in the other set. These two rotations resulted in four sets in the similar condition and four sets in the dissimilar condition.

## Procedure

The study was conducted in the context of classroom sessions. Subjects were told that the study was about advertising and promotions. They were given a booklet of ads and told not to open it until asked to do so. To ensure homogeneity of processing, subjects were instructed to read the ads as they would read ads in a magazine, with the goal of understanding the ad claims. Subjects were shown a practice ad for 20 seconds in order to familiarize them with the task. After the practice, subjects were then exposed for 20 seconds to each of the eight target ads. Claims were presented in the same order for all subjects. The ad booklets were then collected.

Five minutes after having been exposed to the ads (which presumably cleared short-term memory), subjects received a first questionnaire that asked them to match four of the claims (either set A or set B) that they had seen earlier with one of the two stores, whose names were given on the questionnaire. At this point, subjects were thanked for their participation and the regular class was resumed. One hour later, subjects were given a second surprise questionnaire. The second questionnaire tested

their matching accuracy for the set of items on which they had not yet been tested. Next, subjects responded to an open-ended question that asked them to explain how they came up with their answers to the previous question. They then responded to several manipulation and demand check questions. Finally, they were asked various profiling questions such as gender and age.

## Measures

As explained above, subjects were asked to match the claims with the stores at two delay intervals. Each time, they had to make four matches, of which two were plausible and two were implausible. The main dependent measure was the number of correct matches achieved (out of two or four, depending on the analysis). The retrospective protocol about how subjects matched claims to stores at time 2 was also coded and analyzed, as will be explained later.

## Results

*Manipulation and Confounding Checks.* After completing the delayed matching task, subjects were asked to rate the similarity of the ads for the two stores on two seven-point scales anchored by "ads looked very different" (1) and "ads looked very similar" (7) and by "very easy to tell the ads apart" (1) and "very difficult to tell the ads apart" (7). Responses to the two questions were highly correlated ( $r = .52, p < .01$ ) and were averaged to form an index of perceptual similarity. As expected, subjects in the similar condition rated ads as more similar ( $\bar{X} = 5.06$ ) than did subjects in the dissimilar condition ( $\bar{X} = 3.99$ ;  $F(1, 90) = 11.02, p < .01$ ).

Other results from the pretest also hold. Subjects in both similarity conditions paid equal attention to the ads for Food Village Market (similar condition  $\bar{X} = 5.10$ , dissimilar condition  $\bar{X} = 5.05, p > .8$ ) and for Bargain Supermarket ( $\bar{X} = 5.14$  vs.  $\bar{X} = 5.05$ ;  $p > .7$ ). Across conditions, subjects also paid the same amount of attention to each of the ads. Finally, subjects in both similarity conditions paid the same amount of attention to the textual elements ( $\bar{X} = 4.86$  vs.  $\bar{X} = 4.83$ ) and to the visual elements ( $\bar{X} = 5.18$  vs.  $\bar{X} = 5.10$ ). These confounding checks rule out differential allocation of attentional resources as an alternative explanation of the effect of similarity on accuracy. One could have argued, for instance, that subjects exposed to the similar ads paid more attention to the visual elements of the ads (and less attention to the textual elements) than did subjects exposed to the dissimilar ads.

Finally, preliminary analysis showed that none of the counterbalancing factors (e.g., pairing of the store names with the different ad layouts) had significant main effects or interactions with the other factors. The counterbalancing factors are thus ignored in the main analyses.

*Main Analyses.* The matching accuracy scores were submitted to a 2 (similarity)  $\times$  2 (plausibility)  $\times$  2 (time



**TABLE 1**  
EXPERIMENT 1: MEAN MATCHING ACCURACY  
AS A FUNCTION OF SIMILARITY,  
PLAUSIBILITY, AND TIME DELAY

	Time delay			
	Time 1		Time 2	
	Plausible	Implausible	Plausible	Implausible
Similar	1.33	1.18	1.57	1.00
Dissimilar	1.60	1.52	1.64	1.43
Column average	1.45	1.34	1.60 <sup>a</sup>	1.20 <sup>b</sup>

NOTE.—Means in each cell represent the number of correct matches out of two. Means in the same row with different superscript letters are significantly different from each other at  $p < .01$ .

delay) split-plot ANOVA. The transition hypothesis would predict two two-way interactions: a similarity  $\times$  delay interaction and a plausibility  $\times$  delay interaction (or possibly a three-way interaction, depending on the calibration of the manipulations). The mean matching accuracies (out of two) are reported in Table 1.

Evidence of memory-trace refreshment was provided by a main effect of similarity ( $F(1, 89) = 12.49, p = .001$ ). Matching accuracy was higher in the dissimilar-ads condition ( $\bar{X} = 1.55$ ) than in the similar-ads condition ( $\bar{X} = 1.27$ ). In the dissimilar-ads condition, the refreshed memory traces presumably contained more diagnostic perceptual cues than in the similar-ads condition.

Some degree of schematic inferencing was indicated by a main effect of plausibility ( $F(1, 89) = 9.29, p < .01$ ). Matching accuracy was higher for the plausible items ( $\bar{X} = 1.53$ ) than for the implausible ones ( $\bar{X} = 1.27$ ), which suggests that source identification judgments also involve reasoning and inferential processes that assess the plausibility of the pairings.

Support for the transition hypothesis was mixed. As predicted, there was a significant interaction between plausibility and time delay ( $F(1, 89) = 4.59, p < .04$ ), which suggests that reliance on schematic inferencing tends to increase over time. Simple effect tests showed that, after a short delay, matching accuracy was not significantly influenced by the plausibility of the pairings ( $\bar{X} = 1.45$  and  $\bar{X} = 1.34$  for plausible and implausible items, respectively;  $F(1, 89) = 1.02, p = .31$ ). Thus, there was no sign of schematic inferencing after a short delay. However, after a longer delay, matching accuracy was significantly higher for the plausible items ( $\bar{X} = 1.60$ ) than for the implausible items ( $\bar{X} = 1.20$ ;  $F(1, 89) = 13.95, p < .01$ ), which suggests that subjects used the schematic inferencing process.<sup>2</sup>

<sup>2</sup>We replicated these findings in another experiment ( $n = 92$ ) using black-and-white ads instead of color ads. The interaction between plausibility and time delay was again significant ( $F(1, 90) = 3.33$ , one-tailed  $p = .035$ ). Simple effect tests showed that after a short delay, matching accuracy was equally high for the plausible ( $\bar{X} = 1.52$ ) and implausible

**TABLE 2**  
EXPERIMENT 1: PERCENTAGES OF RESPONSES  
IN PROCESS PROTOCOLS (TIME 2)

	Similar-ads condition (%)	Dissimilar-ads condition (%)
Memory-trace refreshment	11.9	33.3
Schematic inferencing	26.2	15.4
Retrieval	40.5	25.7
Pure guessing	14.3	7.7
Combination of processes across items	7.1	17.9

Contrary to our expectations, however, similarity did not interact with delay ( $F < 1$ ). Exposure to perceptually dissimilar ads lead to higher matching accuracy in both the five-minute and the one-hour delay conditions. No other effects were significant.

*Retrospective Process Reports.* Two judges coded the retrospective open-ended process reports (interjudge agreement = 85 percent; disagreements were resolved through discussion). On the basis of a sampling of responses, each report was assigned to one of five categories: (1) direct cued retrieval (e.g., “I just remembered”), (2) memory-trace refreshment (e.g., “Tried to picture the ads in my head sequentially”), (3) schematic inferencing (e.g., “I guessed based on the names of stores and the types of food—whether it was fancy or expensive food or if it was cheap food”), (4) pure guessing (e.g., “mainly guessing”), and (5) a combination of multiple processes across items (e.g., “having some impressions on some messages and also with guess”). Table 2 reports the percentage of subjects reporting each process in each similarity condition.

A somewhat unexpected result, given the difficulty of the learning conditions, was the substantial report of direct retrieval (33 percent). It is possible, however, that this category was artificially inflated because of subjects who replied that they “just remembered” only because they were unable to verbalize their actual source identification process. Few subjects (11 percent) reported relying on pure guessing. Instead, as predicted, they were more likely to rely on either trace refreshment or schematic inferencing (43 percent). It is interesting that the probability of memory-trace refreshment versus schematic inferencing differed across similarity conditions ( $\chi^2(1) = 4.80, p < .05$ ). In the dissimilar-ads condition, subjects reported more memory-trace refreshment than schematic inferencing. On the other hand, in the similar-ads condition, subjects reported more schematic inferencing than memory-trace refreshment. A possible interpretation of

( $\bar{X} = 1.54$ ) store-promotion pairs ( $F < 1$ ). However, after a longer delay, matching accuracy was higher for the plausible pairs ( $\bar{X} = 1.54$ ) than it was for the implausible ones ( $\bar{X} = 1.34$ ;  $F(1, 91) = 3.60$ , one-tailed  $p = .03$ ).

these results is that if the source cannot be quickly retrieved, the default then becomes trace refreshment. Subjects resorted to schematic inferencing only when refreshing the trace failed to provide diagnostic perceptual and contextual cues (similar-ads condition). This contingency would be consistent with the transition hypothesis.

## Discussion

The first objective of this experiment was to show that, in settings where cued retrieval of the source is likely to fail (e.g., single exposure to, and incidental learning of, the message-source association), processes other than pure guessing are invoked. The results indicate that the identification of the source of a message implicates distinct processes of memory-trace refreshment and schematic inferencing. The fact that identification accuracy was higher in the dissimilar-ads condition than in the similar-ads condition shows that subjects reaccessed their memory traces for the original ads with some degree of perceptual and contextual detail (e.g., color, layout). It is these perceptual and contextual details that helped subjects identify the correct store in the dissimilar-ads condition. Confounding checks show that this finding cannot be attributed to differential allocation of attentional resources in the two similarity conditions. Identification accuracy was also found to be higher for the plausible pairings than for the implausible ones. This result indicates that subjects also relied on schematic inferencing, especially after a longer delay. The nature of the design strengthens the thesis that this effect was produced during source identification and not during ad exposure. Indeed, during ad exposure there was actually no correlation between the images of the stores and the images of their offerings, because plausibility was subjected to *within*-subject manipulation. These matching accuracy results converge with the process protocols, which indicate that as many as 43 percent of the subjects relied either on memory-trace refreshment or on schematic inferencing.

The second objective of this experiment was to examine the contingency between these two processes. Support for the transition hypothesis was mixed. As predicted, there was an increased reliance on schematic inferencing after a longer time delay. The fact that schematic inferencing was not significant after a short delay indicates that it is *not* the next process consumers rely on in case of retrieval failure. Should cued retrieval fail, consumers seem to first try to refresh their memory traces, as evidenced by the significant effect of perceptual similarity after a short delay. Further support comes from the process protocols. Subjects were more likely to report using schematic inferencing when the contextual cues in the memory traces were presumably less diagnostic (similar-ads condition). Reliance on schematic inferencing therefore appears to depend on the inability to access a diagnostic trace of the learning episode.

It was unexpected, however, that perceptual similarity would still exert a strong influence on matching accuracy after a longer delay. A plausible explanation could be an

inadequate calibration of the similarity and time manipulations. The manipulation may have created memory traces that were so distinctive in the dissimilar condition that they retained much of their diagnosticity for source identification one hour later. Indeed, inspection of the means in Table 1 suggests that, after a longer delay, schematic inferencing was mostly used in the similar-ads condition, where the perceptual and contextual details were presumably nondiagnostic.<sup>3</sup> Another explanation for the significant effect of similarity at time 2 could be that the similarity manipulation also affects the retrieval process. For example, dissimilar ads may also encourage stronger connections in memory, thereby aiding semantic cued retrieval.<sup>4</sup> These issues are examined in experiment 2.

To summarize, experiment 1 demonstrates that processes other than semantic cued retrieval and pure guessing may underlie source identification, namely, memory-trace refreshment and schematic inferencing. The study also offers evidence of an important contingency between these two processes. Schematic inferencing appears to be invoked only when the original trace for the learning episode cannot be accessed to provide diagnostic source information. There were also signs of cued retrieval and pure guessing processes. Only 11 percent of the subjects reported using pure guessing. Although this finding may partly reflect a social-desirability effect, it is also consistent with the argument that pure guessing is relatively rare when people are at least somewhat motivated to be accurate. Nevertheless, to draw firm conclusions about the contingencies affecting cued retrieval and pure guessing, it is necessary to examine how all four processes operate together. This issue was addressed in experiment 2.

## EXPERIMENT 2

According to our framework (see Fig. 1), trace refreshment and schematic inferencing are invoked sequentially if direct retrieval fails. Pure guessing is used only as a last resort or when motivation for accuracy is very low. Experiment 1 focused on the part of the framework that describes the features of trace refreshment and schematic inferencing, and the transition between these two processes. The experiment had little to say about cued retrieval and pure guessing because neither process was manipulated or measured (except through verbal protocols). The purpose of this second experiment was therefore to examine how the four processes jointly operate in source identification of marketing communications.

In experiment 1, we examined trace refreshment, sche-

<sup>3</sup>A post hoc analysis within the longer time delay condition reveals a similarity  $\times$  plausibility interaction ( $F(90) = 3.36, p = .07$ ). Follow-up contrasts suggest that plausibility had an effect on accuracy in the similar condition ( $F(1, 90) = 17.79, p < .01$ ) but not in the dissimilar condition ( $F(1, 90) = 1.91, p = .17$ ). However, this evidence should be interpreted with caution because the three-way interaction was not significant.

<sup>4</sup>We thank the associate editor for pointing out this possibility.

matic inferencing, and the transition between the two purely experimentally, by manipulating perceptual similarity, plausibility, and time delay. A major drawback of a purely experimental approach is that it allows consideration of only one or two processes and contingencies at a time. If, as in source identification, a higher number of processes and contingencies are involved, studying all the processes in a single experiment with straightforward manipulations becomes extremely difficult. For instance, our failure to observe a decreased use of memory-trace refreshment over time in experiment 1 may be attributed to the fact that our similarity manipulation affected more than one process. We therefore developed a new design and analysis methodology that allows us to obtain separate estimates of cued retrieval, memory-trace refreshment, schematic inferencing, and pure guessing.

To examine the sequence among these four processes, we combined this methodology with two experimental factors. First, as in experiment 1, we manipulated the delay between message exposure and testing. Time delay was increased in the long-delay condition to reduce the accessibility of the original memory traces and provide a more potent test of the transition hypothesis. Second, the experiment also used Jacoby's (1991) divided-attention paradigm to manipulate the amount of processing resources available for source identification. This manipulation allows us to assess the capacity demands of the different source identification processes. The logic of this type of paradigm is the following (Jacoby 1991): If performance on a task is insensitive to whether subjects perform it with full or with divided attention, then the process underlying performance of the task is largely automatic, that is, requires little processing capacity (Bargh 1989). If, on the other hand, performance on a task deteriorates under divided attention, then the process underlying the performance of the task requires significant processing capacity.

Assessing the capacity demands of the different processes can provide the several insights. First, according to our framework, when the message content–source association has been strongly encoded (e.g., through repetition of the association), cued retrieval is likely to be the primary process of source identification. This proposition rests on the assumption that cued retrieval of well-learned associations should be almost instantaneous and nearly effortless (see, e.g., Anderson 1990; Moscovitch 1994). The automaticity of cued retrieval makes it more likely to precede other more effortful processes of source identification (see Gilbert 1989). It is therefore important to assess the processing capacity required for source identification through cued retrieval. As shown by the pilot study, the procedure used in our studies (e.g., single exposure to the ads, numerous associations to be learned) results in a relatively *weak* encoding of the message content–source association. If we observe that, despite the weakness of this encoding, cued retrieval of the source is still relatively automatic, we would have evidence that this process may be even more spontaneous and primary when the association has been better learned.

Second, the process protocols from experiment 1 suggest that subjects were able to verbalize their reliance on trace refreshment and schematic inferencing. Although consumers may be aware of using these two processes, it is not clear how capacity demanding these processes are, and manipulating processing capacity allows us to examine this issue. Finally, this processing capacity manipulation also helps pinpoint when pure guessing is likely to be invoked. If pure guessing is used only as a last resort, reliance on this process should increase when interference prevents reliance on the other processes. If we assume that pure guessing requires little processing capacity, the likelihood of reliance on this process should be higher when the resources available for source identification are reduced (in the divided-attention condition).

## Overview of the Methodology

As in experiment 1, subjects were exposed to print advertisements for fictitious grocery stores and were subsequently asked to identify the source (store) of each advertised claim. Our new methodology involved using three sources, instead of two as in the previous study. The stimuli were constructed in such a way that each type of process had a certain a priori probability of leading to one of the three sources. For instance, pure guessing would lead a given item to be attributed to each of the three stores with an equal probability of 33 percent. Suppose now that two of the three stores have a downscale image and that the third store has an upscale image. If an item is downscale, pure schematic inferencing has a 50 percent probability of leading to each of the two downscale stores. The conditional probability that an upscale store is identified as the source of a downscale item given a schematic inferencing process should be zero. On the basis of this logic, we developed a model that decomposes the probabilities of each process being used by analyzing the entire pattern of responses, correct identifications as well as mistakes, across items (see the section titled A Process Decomposition Model).

## Design and Stimuli

Thirty-six students participated in the experiment in a  $2 \times 2 \times 2$  mixed design for a \$20 incentive. As before, plausibility was manipulated within subjects and time delay was manipulated such that subjects responded to the matching questions on different sets of items in the immediate versus delayed conditions. Availability of cognitive resources at the time of the matching task was manipulated between subjects.

All subjects were exposed to 24 ads, eight from each of three stores. For each store, four ads featured upscale claims and four featured downscale claims. The perceptual similarity or dissimilarity across ads was operationalized with the same layout and color variations as in experiment 1. Two of the three stores, Bargain Supermarket and Food Village Market, had perceptually similar ads. However, as demonstrated by experiment 1, these stores'

names evoked different (downscale vs. upscale) schemas. The third store, Max Discount Grocery, had ads that were perceptually dissimilar from those of the other two stores. However, its name evoked a (downscale) schema comparable to that of Bargain Supermarket. Therefore, because of the specific structure of our stimuli, reliance on schematic inferencing and reliance on memory-trace refreshment should produce distinct and predictable patterns of correct and incorrect source attributions. These patterns would be significantly different from those produced by cued retrieval and pure guessing.

## Manipulations

*Plausibility.* This factor was manipulated as in experiment 1. Plausible (implausible) claims were those in which the image of the claim matched (mismatched) the image of the store. An example of a plausible claim is “Roquefort cheese available at our store” advertised by Food Village Market. The same claim advertised by Bargain Supermarket would be implausible. Three sets consisting of four upscale claims and four downscale claims, were rotated across the different stores, creating three stimuli sets. This ensured that a particular claim was paired with every store across subjects.

*Time Delay.* Subjects responded to one set of 12 store matching questions after a five-minute delay and a second set of 12 questions after a two-day delay. Two subjects failed to participate at time 2, resulting in a sample size of 34 in the delayed condition.

*Cognitive Resources.* Cognitive resources available for the matching task were manipulated by requiring subjects in the constrained-resources condition to divide their attention between two tasks at the time of matching. We used a procedure identical to the one described by Jacoby (1991). Subjects in the divided-attention condition were required to track a list of recorded numbers and say “Now” whenever three odd numbers occurred in a row. If the subject missed such a series, the experimenter would say “Miss.” Subjects were instructed to track the numbers and to perform the source matching task simultaneously. To ensure that the two tasks received equal attention, subjects were told that those with the best performance on both tasks combined would receive a prize. Subjects in the full-attention condition completed the source-matching task without performing a second task. To equate motivation for accuracy across conditions, these subjects were also told that those with the best performance on the matching task would receive a prize.

## Procedure

Subjects were run individually or in groups of up to three and were randomly assigned to the divided- or full-attention condition. The cover story and instructions were the same as those described in experiment 1. After seeing a practice ad for 20 seconds, subjects were exposed to the 24 target ads for 20 seconds each (in the same order

for each subject). Subjects then responded to filler questions concerning how much attention they paid to the ads, their interest in different types of promotions, and provided demographic information. Next, subjects matched half (12) of the claims with the three stores (either set A or set B). After practice with the digit tracking task, subjects in the divided-attention condition performed the matching and digit-tracking tasks simultaneously. Subjects then reported their interest in the experiment. Finally, they were told to return in two days for a different study conducted by a different researcher.

Two days later, subjects were asked to match the other 12 claims with the three stores (i.e., set B or set A). Subjects in the divided-attention condition at time 1 were also under divided attention at time 2. Then, all subjects answered several closed-ended questions on the processes that they used and responded to manipulation checks on similarity and store image. Finally, subjects were debriefed, paid, and dismissed.

## Measures

The primary dependent variable was based on the frequency distribution of responses (across the three stores) to each matching question. There were a total of 24 ads; 12 featured upscale claims and 12 featured downscale claims. Twelve claims (six upscale and six downscale) were tested at time 1, and a different set of 12 claims (six upscale and six downscale) were tested at time 2. Within each set of 12 claims, four claims (two upscale and two downscale) were advertised by each of the three stores. Therefore, at each time delay, subjects were tested on four claims—one subset of two upscale claims and one subset of two downscale claims—actually made by each of the three stores. Responses were combined (separately for the full- and divided-attention subjects) for the subset of two upscale items and the subset of two downscale items. We then computed the frequency distribution for each subset and each store (see Table 3). For example, we broke down the 72 responses ( $36 \text{ subjects} \times 2 \text{ claims}$ ) to upscale items advertised by Bargain Supermarket into correct responses, responses that incorrectly attributed the claim to Food Village Market, and responses that incorrectly attributed the claim to Max Discount Grocery. As described below, our process decomposition model combines these frequency distributions with a priori probabilities to estimate the probability of using each type of process under full versus divided attention, at time 1 and at time 2.

## Manipulation and Confounding Checks

As intended, ads for Food Village Market (FVM) and Bargain Supermarket (BS) were rated as looking extremely similar ( $\bar{X} = 5.53$  on a seven-point similarity scale), whereas ads for Food Village Market and Max Discount Grocery (MDG;  $\bar{X} = 1.97$ ) and for Bargain Supermarket and Max Discount Grocery ( $\bar{X} = 2.35$ ) were rated as looking extremely different. The rating for simi-

TABLE 3

EXPERIMENT 2: PROBABILITY DISTRIBUTION OF MATCHING RESPONSES AS A FUNCTION OF ATTENTION AND TIME DELAY

	Bargain Supermarket: <sup>a</sup> downscale image/similar ad			Food Village Market: <sup>a</sup> upscale image/similar ad			Max Discount Grocery: <sup>a</sup> downscale image/dissimilar ad		
	BS <sup>b</sup>	FVM <sup>b</sup>	MDG <sup>b</sup>	BS <sup>b</sup>	FVM <sup>b</sup>	MDG <sup>b</sup>	BS <sup>b</sup>	FVM <sup>b</sup>	MDG <sup>b</sup>
Divided attention:									
Time 1:									
Two upscale items	.36	.42	.22	.31	.44	.25	.23	.31	.46
Two downscale items	.44	.31	.25	.33	.44	.22	.19	.25	.56
Time 2:									
Two upscale items	.19	.31	.50	.20	.53	.27	.35	.41	.25
Two downscale items	.41	.28	.31	.38	.38	.25	.41	.31	.28
Full attention:									
Time 1:									
Two upscale items	.35	.44	.21	.25	.56	.19	.11	.22	.67
Two downscale items	.49	.31	.20	.31	.61	.08	.20	.20	.60
Time 2:									
Two upscale items	.33	.44	.22	.22	.47	.31	.28	.42	.31
Two downscale items	.33	.19	.47	.33	.36	.31	.25	.28	.47

NOTE.—BS = Bargain Supermarket; FVM = Food Village Market; MDG = Max Discount Grocery. Each entry denotes the percentage of subjects selecting that store as the actual response out of 36 total subjects in time 1 and 34 total subjects in time 2. For example, the second entry in the first row, .42, should be read as "under divided attention at time 1, 42 percent of the subjects answered that the source of the two upscale items was Food Village Market, whereas the correct answer was Bargain Supermarket." Note that the percentage of observed responses attributed to each of the three stores for each correct response adds up to 100.

<sup>a</sup>Correct response.

<sup>b</sup>Observed response.

ilarity of the Food Village Market and Bargain Supermarket ads was significantly greater than that for the similarity between the other two pairs ( $p$ 's < .01). Immediately after reading the ads, subjects responded that they read all three ads extremely carefully (FVM  $\bar{X}$  = 5.78, BS  $\bar{X}$  = 5.81, MDG  $\bar{X}$  = 5.69 on seven-point scales,  $F < 1$ ). At time 2, subjects reported that they paid the same amount of attention to the text versus the visuals toward ads from all three stores (FVM  $\bar{X}$  = 4.24, BS  $\bar{X}$  = 4.35, MDG  $\bar{X}$  = 3.94;  $F(2, 66) = 1.15$ ,  $p > .3$ ).

Image of the three stores was manipulated as intended ( $F(2, 66) = 2.78$ ,  $p = .07$ ). Food Village Market was rated to be more upscale ( $\bar{X}$  = 4.65 on a seven-point scale) than Bargain Supermarket ( $\bar{X}$  = 3.77) and Max Discount Grocery ( $\bar{X}$  = 3.74). Max Discount Grocery was perceived to have a similar image to that of Bargain Supermarket ( $p > .9$ ).

## A Process Decomposition Model

This new model of process decomposition estimates the probability of using each of the four specified process (e.g.,  $p(\text{cued retrieval})$ ) in three steps.

**Step 1: Marginal Probabilities.** We first need the marginal probability of attributing claims to each of the stores, for instance,  $p(\text{responding store A})$ . These probabilities are given by the frequency distributions of responses listed in Table 3. Recall that the responses were combined within subsets of two claims. These subsets could be either upscale or downscale. Across conditions

these subsets were actually associated with each of the three stores (i.e., the correct association could be one of three stores). Finally, subjects could (correctly or mistakenly) attribute each subset to each of the three stores. There were therefore 18 ( $2 \times 3 \times 3$ ) observed marginal probabilities for each of the divided-attention and full-attention conditions and for each of time 1 and time 2.

**Step 2: Conditional Probabilities.** From the specific structure of the stimuli, we next derive the conditional probability of providing a particular response *if* a specific process is used, for example,  $p(\text{responding A/trace refreshment})$ . To derive these conditional probabilities, we first specify that four types of processes can be used to match a store with a given claim: (1) cued retrieval of the associated store, (2) refreshment of the perceptual memory trace for the learning episode, (3) schematic inferencing based on the image of the stores and that of the claims, and (4) pure guessing. Consistent with previous research on process decomposition (e.g., Jacoby 1991; Mandler 1980), our assumption is that these four processes are used independently; any one of them is used in matching each claim with a store. On the basis of the stimuli construction, we can then specify the conditional probability of attributing a given claim to each store (e.g., Store A), given that a specific process (e.g., memory-trace refreshment) was used. These conditional probabilities are given in Appendix B.

**Step 3: Process Probabilities.** To estimate the probabilities of using the different processes (e.g.,  $p(\text{cued re-$

**TABLE 4**  
EXPERIMENT 2: ESTIMATED PROCESS PROBABILITIES

	Time delay			
	Time 1		Time 2	
	Divided attention	Full attention	Divided attention	Full attention
Cued retrieval	.08	.18	.01	.04
Trace refreshment	.20	.29	.01	.01
Schematic inferencing	.07	.06	.08	.17
Guessing	.66	.48	.90	.78

NOTE.—These probabilities were estimated on the basis of conditional and marginal probabilities (see Eq. [1]).

trieval)), we need to relate these probabilities to those derived in steps 1 and 2. The relationship is given by Equation (1):

$$\begin{aligned}
 &p(\text{responding store } A) \\
 &= p(\text{responding } A/\text{cued retrieval}) \times p(\text{cued retrieval}) \\
 &\quad + p(\text{responding } A/\text{trace refreshment}) \\
 &\quad \times p(\text{trace refreshment}) \\
 &\quad + p(\text{responding } A/\text{inferencing}) \times p(\text{inferencing}) \\
 &\quad + p(\text{responding } A/\text{guessing}) \times p(\text{guessing}).
 \end{aligned} \tag{1}$$

It can be seen from Equation (1) that the probabilities of using each type of process can be estimated using least squares regression. The dependent variable in the regressions (through the origin) would be the marginal probabilities of responding observed in step 1, and the independent variables would be the conditional probabilities specified in step 2. The estimated process probabilities are given by the regression coefficients. In addition, if we assume that these are the only four possible processes and that they are mutually exclusive, the probability of using each of the four processes should sum to 1:

$$\begin{aligned}
 &p(\text{cued retrieval}) + p(\text{trace refreshment}) \\
 &\quad + p(\text{inferencing}) + p(\text{guessing}) = 1
 \end{aligned} \tag{2}$$

Therefore, the probability of using any process can be reexpressed in terms of the sum of the probabilities of using the other three processes:

$$\begin{aligned}
 &p(\text{trace refreshment}) = 1 - (p(\text{cued retrieval}) \\
 &\quad + p(\text{inferencing}) + p(\text{guessing}))
 \end{aligned} \tag{3}$$

Substitution of Equation (3) into Equation (1) simplifies estimation. Each attentional condition provides 18 observations at time 1 and at time 2.

### Estimated Process Probabilities

The results are presented for each type of process. The estimated process probabilities are reported in Table 4.

As an example, the first entry in the table, .08, is the probability of using cued retrieval at time 1 under divided attention.

*Probability of Cued Retrieval.* Given the large number of ads that subjects saw (total of 24 ads from three different stores), it is not surprising that the probability of cued retrieval was generally low and was significant only at time 1 under both full- (probability = .18,  $p < .01$ ) and divided-attention conditions (probability = .08,  $p < .01$ ). Consistent with the assumption that cued retrieval does not require significant cognitive resources, the probability of reliance on this process is equivalent in the full- (probability = .13) and the divided-attention conditions (probability = .08;  $p > .2$ ). As expected, the probability of cued retrieval was greater at time 1 than at time 2 (probability = .13 vs. probability = .03;  $z = 2.13$ ,  $p < .05$ ).

*Probability of Trace Refreshment.* As expected, there was a substantial probability of trace refreshment only at time 1 under both full (probability = .29,  $p < .01$ ) and divided attention (probability = .20,  $p < .01$ ). Consistent with the transition hypothesis, this probability decreased strongly over time (probability = .25 vs. probability = .01;  $z = 3.57$ ,  $p < .01$ ). The process of memory-trace refreshment also appears to require significant cognitive resources. The probability of trace refreshment was significantly greater when attentional resources were available (vs. diminished) at time 1 (probability = .29 vs. probability = .20;  $z = 2.72$ ,  $p < .01$ ).

*Probability of Schematic Inferencing.* Consistent with the transition hypothesis and with results of experiment 1, in the full-attention condition the probability of schematic inferencing was significantly higher at time 2 (probability = .17) than at time 1 (probability = .06;  $z = 1.99$ ,  $p < .05$ ). This pattern was not observed in the divided-attention condition, where the probabilities were equivalent at time 1 (probability = .06) and at time 2 (probability = .08). Therefore, resource availability appears to have some influence on the likelihood of schematic inferencing. However, the main effect of this factor was not significant (probability = .12 vs. probability = .08;  $p > .2$ ). Although this lack of significance may indicate that schematic inferencing did not require significant cognitive resources, it could also be due to a floor effect or a lack of power. Other evidence discussed below suggests that this process was somewhat effortful.

*Probability of Guessing.* Because of the large number of stimuli involved, the probability of pure guessing was generally high and was significant under all conditions ( $p$ 's  $< .01$ ). As expected, this probability was greater at time 2 (probability = .84) than at time 1 (probability = .57;  $z = 3.46$ ,  $p < .01$ ). Consistent with expectations, the probability of guessing was marginally greater in the divided-attention condition (probability = .82), where processing resources were constrained, than in the full-attention condition (probability = .63;  $z = 1.78$ ,  $p < .10$ ).

This finding confirms that pure guessing requires few cognitive resources. More important, the finding suggests that this process is only invoked when contextual conditions preclude reliance on other processes, as posited by our framework.

**Retrospective Reports.** At time 2, subjects were asked to rate the extent to which they used each of the four processes on a five-point scale, where 1 = "never used the process" and 5 = "almost always used the process." For example, to test the use of the schematic inferencing process subjects were asked to respond on the scale to the statement "I thought about how likely it was that each of the stores would make a given offer." Across the divided- versus full-attention conditions, there were no significant differences in the reported use of cued retrieval (divided attention  $\bar{X} = 2.44$ , full attention  $\bar{X} = 2.17$ ,  $p > .45$ ) and trace refreshment (divided attention  $\bar{X} = 2.69$ , full attention  $\bar{X} = 3.33$ ,  $p = .2$ ). However, subjects in the full-attention condition expressed more schematic inferencing than subjects in the divided-attention condition (full attention  $\bar{X} = 3.72$  vs. divided attention  $\bar{X} = 2.25$ ,  $F(1, 32) = 14.47$ ,  $p < .01$ ). This result suggests that schematic inferencing may be more cognitive resource dependent than is suggested by the probability estimates. Consistent with the model's estimates, subjects in the divided-attention condition reported guessing more than subjects in the full-attention condition ( $\bar{X} = 3.62$  vs.  $\bar{X} = 2.44$ ;  $F(1, 32) = 7.84$ ,  $p < .01$ ).

Further evidence that both memory-trace refreshment and schematic inferencing consume significant cognitive capacity comes from the correlations of the reported process with responses to the question on how hard subjects tried when identifying the source. This correlation is significant for both the memory-trace refreshment process ( $r = .36$ ,  $p < .05$ ) and the schematic inferencing process ( $r = .35$ ,  $p < .05$ ). As expected, this correlation is negative for the guessing process, suggesting that subjects who used mostly guessing did not try very hard ( $r = -.38$ ,  $p < .05$ ).

## Discussion

The process decomposition results support the idea that source identification involves four different processes, which appear to be used in a contingent manner. Existing theorizing on associative learning (see, e.g., Anderson 1983, 1990; Baddeley 1990) suggests that if encoding conditions allow a strong association between the message content and the source to be built, consumers will have a high chance of retrieving the source from memory, and this retrieval will be largely spontaneous and effortless. We speculate that, in these conditions, cued retrieval is likely to be the dominant process of source identification, and that processes such as trace refreshment and schematic inferencing are invoked only if cued retrieval fails. However, we cannot offer direct evidence of this particular contingency. The only evidence that we have at this stage is tentative. We observed, as expected,

that cued retrieval did not require significant processing resources, even though, in this study, learning of the source associations was far from optimal. Given that the processing demands of trace refreshment were more substantial, it seems to make sense that cued retrieval should be invoked before trace refreshment is attempted (see, e.g., Gilbert 1989). It is clear that more direct evidence for this hypothesized part of the framework needs to be obtained. A possible approach is suggested in the General Discussion.

Consistent with the results of experiment 1, the results of experiment 2 again supported the transition hypothesis that over time reliance on trace refreshment decreases, whereas reliance on schematic inferencing increases. After a short delay, there was a substantial probability of trace refreshment and a small probability of schematic inferencing. After a longer delay, the probability of using trace refreshment was negligible, whereas the probability of schematic inferencing became substantial. These findings are consistent with the proposition that consumers prefer to rely on memory-trace refreshment *before* resorting to schematic inferencing. We conjecture that their preference for the cognitively demanding trace refreshment process comes from the fact that perceptual traces are perceived to provide more reliable information than reasoning processes that require inferential leaps.

It was also observed that the likelihood of pure guessing increased when resources for source identification were limited. In other words, subjects resorted to this process especially when the contextual conditions prevented them from using other processes. This finding is consistent with the argument that, if given at least some motivation for being accurate, pure guessing is a process of last resort.

Finally, the results are ambiguous as to whether the use of schematic inferencing requires significant cognitive capacity. The process probability estimates suggest that it does not. On the one hand, the probability of using this process at time 2 was not significantly higher in the full-attention condition than in the divided-attention condition. On the other hand, retrospective reports suggest that schematic inferencing required significant cognitive resources. This issue deserves further investigation. Perhaps the capacity requirements of schematic inferencing depend on how often a given person has invoked a particular inference. It may be that over time inferences such as "upscale (downscale) stores offer upscale (downscale) items," become "compiled" by certain people, hence requiring little cognitive resources (see, e.g., Anderson 1983).

## GENERAL DISCUSSION

The importance of source identification in marketing communications has been overlooked. In a communication-dense environment, where exposure to communication is usually incidental and temporally separated from decision making, even convincing messages can be futile if consumers remember their content but cannot recollect their source. There is growing empirical evidence that



message content is often dissociated from its sources (e.g., Collins 1996; *Nieuwstribune* 1993). Our pilot study further illustrates this point: Memory for a claim does not necessarily imply ability to identify its source. The issue of source identification is relevant to many forms of marketing communication. It applies to any setting in which encoding of a communication content (e.g., a claim, an advertised sale, a product in a display, a sponsored event) is not necessarily accompanied with strong associative encoding of its source.

If we consider the importance of the source (mis)identification phenomenon, the primary contribution of this research is to theoretically examine the processes underlying source identifications. Combining insights from both associative network models and research on source monitoring, we propose a framework that distinguishes four types of source identification processes in marketing settings and delineates their contingencies. The primary limitation of this research is that only portions of this framework could be tested in the two reported experiments. It is clear that further research is needed to substantiate a number of the framework's assumptions.

So far, current evidence suggests the following. Associative network models imply that source information is essentially recollected through direct cued retrieval. We indeed observed a significant amount of direct retrieval in both experiments. People's phenomenal experience of this process seems to be captured by statements such as "I just remembered." Experiment 2 suggests that source identification through this process was relatively effortless. This finding is interesting because learning of the message-source association was difficult in our studies. It is possible that in situations where a message-source link has been strongly encoded, source identification through cued retrieval becomes even more automatic. One could therefore speculate that in such situations cued retrieval may be the primary process of source identification. However, further research is needed to establish the primacy of cued retrieval. One approach would be to manipulate the strength of encoding of the message-source association. If cued retrieval is relied upon prior to the other processes, stronger encoding of the association should result in a decreased probability of reliance on trace refreshment and schematic inferencing.

We also found evidence of substantial memory-trace refreshment. This process differs from direct cued retrieval in that subjects appear to actively revive their original memory traces for the learning episode with ample perceptual and contextual details. People seem to inspect these traces for any evidence indicative of the source. Although the source-monitoring literature speculates that people rely on memory traces spontaneously and with little awareness, our research suggests that memory-trace refreshment for source identification of marketing communications is somewhat effortful, and therefore it cannot be labeled automatic.

Despite being effortful, trace refreshment seems to be preferred to more strategic reasoning processes and appears to be attempted before schematic inferencing. Con-

sistent with the transition hypothesis, trace refreshment was significant after short delays, whereas schematic inferencing was most influential after longer delays. This increased reliance on schematic inferencing over time was replicated in a previous experiment not reported here (see n. 4). The robustness of this result can be assessed by aggregating across studies the *p*-values associated with this effect (Rosenthal 1978). Across experiments 1 and 2 and the earlier experiment, the aggregate significance of this effect is  $p = .005$ , one-tailed.

Schematic inferencing may also explain the well-known "sleeping effect." Attitudinal responses to a message are enhanced when positive memories of its content become dissociated from a less favorably evaluated source over time (see, e.g., Hannah and Sternthal 1984). As demonstrated in this research, such dissociation could then lead to schematic inferencing that leads to an assumption that the advocacy was delivered by a plausible and more favorable source than the one that actually presented the information. Schematic inferencing that results in attributing the message to a source with the same valence as the actual source could also explain the frequent failure to find a sleeping effect.<sup>5</sup> The processes of source identification may therefore have important implications for persuasion research.

The data are ambiguous as to whether schematic inferencing in source identification is effortful. This issue may depend on the type of inference and on how much experience a person has within this particular domain. It is indeed possible that over time certain schematic inferences become compiled and no longer require significant processing resources (see, e.g., Anderson 1983). To examine this issue, it would be useful to test different types of schematic inferencing rules that vary in their accessibility in memory, that is, in the strength of the expectancy that is created (see Stangor and Ruble 1989).

There was also significant evidence of pure guessing. Although reliance on this process appeared to be limited in experiment 1, it was very strong in experiment 2. This latter finding is hardly surprising given the difficulty of the task in the second study (24 ads from three stores). Yet, from a theoretical standpoint, it is not the absolute level of pure guessing that is important. It is the conditions that increase or decrease the likelihood of reliance on this process. It was found in experiment 2 that the probability of guessing was higher in the divided-attention condition than in the full-attention condition. This finding suggests that this process was *not* subjects' preferred mode of source identification. Apparently, people who are somewhat motivated to be accurate resort to pure guessing only when the task environment precludes the use of other processes. A worthwhile extension of our research would be to manipulate subjects' motivation for accuracy and to examine how this factor influences reliance on the difference processes.

An important contribution of this article lies in the

<sup>5</sup>We thank the editor for making these observations.



design and analyses of experiment 2. Our integrated design and analysis methodology provides insights into the use of the different processes that would not be possible using standard designs and ANOVAs. This methodology should appeal to many researchers interested in decomposing various types of processes (e.g., choice rules). A potential weakness of our methodology is that it assumes that the different processes are independent. Al-

though there is some precedent for this assumption (see, e.g., Jacoby 1991), it is possible that the processes are not totally independent (see, e.g., Johnson et al. 1988). For example, memory-trace refreshment and schematic inferencing may be used simultaneously and act as a check on each other. Relaxing the independence assumption would be another interesting avenue for future research.

## APPENDIX A

**TABLE A1**  
COUNTERBALANCING CONDITIONS IN EXPERIMENT 1

Set	Similarity	Ad layouts <sup>a</sup>		Plausible pairings: claims paired with <sup>b</sup>		Implausible pairings: claims paired with <sup>b</sup>	
		Bargain	Food Village	Bargain	Food Village	Bargain	Food Village
1	Similar	Layout 1	Layout 2	1, 2	5, 6	7, 8	3, 4
2	Similar	Layout 2	Layout 1	1, 2	5, 6	7, 8	3, 4
3	Similar	Layout 1	Layout 2	3, 4	7, 8	5, 6	1, 2
4	Similar	Layout 2	Layout 1	3, 4	7, 8	5, 6	1, 2
5	Dissimilar	Layout 1	Layout 3	1, 2	5, 6	7, 8	3, 4
6	Dissimilar	Layout 3	Layout 1	1, 2	5, 6	7, 8	3, 4
7	Dissimilar	Layout 1	Layout 3	3, 4	7, 8	5, 6	1, 2
8	Dissimilar	Layout 3	Layout 1	3, 4	7, 8	5, 6	1, 2

<sup>a</sup>Layouts 1 and 2 are perceptually similar; layouts 1 and 3 are perceptually dissimilar.

<sup>b</sup>Claim numbers 1–4 are downscale, and claim numbers 5–8 are upscale.

## APPENDIX B

**TABLE B1**  
EXPERIMENT 2: CONDITIONAL PROBABILITIES FOR EACH COMBINATION OF UPSCALE VERSUS DOWNSCALE CLAIM AND STORE

	Bargain Supermarket: <sup>a</sup> downscale image/similar ad			Food Village Market: <sup>a</sup> upscale image/similar ad			Max Discount Grocery: <sup>a</sup> downscale image/dissimilar ad		
	BS <sup>b</sup>	FVM <sup>b</sup>	MDG <sup>b</sup>	BS <sup>b</sup>	FVM <sup>b</sup>	MDG <sup>b</sup>	BS <sup>b</sup>	FVM <sup>b</sup>	MDG <sup>b</sup>
Upscale claim:									
Cued retrieval	1	0	0	0	1	0	0	0	1
Memory trace refreshment	.5	.5	0	.5	.5	0	0	0	1
Schematic inferencing	0	1	0	0	1	0	0	1	0
Guessing	.33	.33	.33	.33	.33	.33	.33	.33	.33
Downscale claim:									
Cued retrieval	1	0	0	0	1	0	0	0	1
Memory trace refreshment	.5	.5	0	.5	.5	0	0	0	1
Schematic inferencing	.5	0	.5	.5	0	.5	.5	0	.5
Guessing	.33	.33	.33	.33	.33	.33	.33	.33	.33

NOTE.—Each entry in the table provides the conditional probability of responding to the store in the column, given the use of the process in the row. For example, when the correct answer is Bargain Supermarket, the probability of responding "Bargain Supermarket" using the cued retrieval process is 1. The probabilities for memory-trace refreshment are based on the similar memory traces for Bargain Supermarket and Food Village Market. The probabilities for schematic inferencing are based on the match between the claim and the store on image (upscale vs. downscale).

<sup>a</sup>Correct response.

<sup>b</sup>Observed response.

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