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The effects of invalidating information on consumers subsequent search patterns

David Mazursky¹

The Hebrew University, Mt. Scopus, 91905 Jerusalem, Israel

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Abstract

The study explores the search strategies adopted by consumers upon learning that product information which was acquired in the past, is invalid. To date, the literature has devoted little attention to consumers' attempts to resolve the choice problem created by the invalidation of previously acquired product information. In reality however, consumers can actively search for additional information in an attempt to resolve the choice problem when they form subsequent judgments. Accordingly, the characteristics of post-invalidation search as well as the effect on judgment formation were assessed. The reaction to invalid information was found to influence the search strategies concerning the invalidated and additional alternatives. The search process following invalidation was more extensive, the invalidated attribute was accessed more frequently, and the search sequence appeared to alter during the search process. The implications concerning strategies used in processing new information following invalidation, are discussed. © 1998 Elsevier Science B.V. All rights reserved.

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¹ Tel.: 972 2 5883235; fax: 972 2 5881341; e-mail: msmazur@olive.msc.huji.ac.il.

1. Introduction

Product judgments are sometimes based on information which is later shown to be invalid. We may learn that, contrary to an earlier warranty claim, a service contract has been discontinued. A message invalidating the information acquired previously may be communicated *after* we had evaluated the product or made a purchase decision (for instance, at a store check-out). There is a relatively large number of potential cases in which invalid information can be processed and lead to false judgments. Considering price related information alone, examples include misplaced reduced price tags, misplaced merchandise among “sale” items, or grouped display of brands leading to false inferences that a sale tag of one brand applies also to the other brands.

Past research investigating the outcomes of invalidating messages has focused on the effectiveness of policies that are aimed at correcting or removing the impact of invalid information. This has been investigated in research on corrective advertising (e.g. Dyer and Kuehl, 1974; Schul and Mazursky, 1990; Wilkie et al., 1984), in the discounting paradigm (e.g. Anderson et al., 1980) and in studies on the sleeper effect (e.g. Hannah and Sternthal, 1984; Mazursky and Schul, 1988). The present research explores the consequences of invalidation of previous information. It focuses on the search strategies adopted by consumers upon learning that part of the information they had originally considered was invalid, in their attempt to improve subsequent product judgments.

The experience of invalidation may lead consumers to question their past judgments and reassess the rules they previously employed in forming their judgments (Bettman, 1979). Upon invalidation of an item of previous information, consumers face a dilemma concerning their subsequent search behavior. They can either (1) *not* search for additional information and form judgments based only on the subset of items that have not been invalidated (i.e. those valid items which remain after the invalid claims have been disclaimed) without resolving potential cognitive conflict (e.g. “I will buy this brand here although in the future I will not come near this store again”), or (2) decide to engage in search for more information concerning the invalidated brand or other alternative brands in an attempt to resolve inconsistencies and thereby render the information on which subsequent judgments are based, sufficient and valid.

To date, most of the relevant studies in the psychological and marketing context have not permitted the option of seeking additional information.

These studies implicitly implied that judgments are based on the first option above, namely, that no additional information is made available, in making subsequent judgments (e.g. Dyer and Kuehl, 1974). In studies subscribing to the *belief perseverance* paradigm, for example, participants are required to form judgments immediately after receiving the disconfirming cue without acquiring additional relevant information (e.g. Wyer and Unverzagt, 1985). Even if judgment is delayed, no relevant information acquisition is permitted during the delay interval (see studies on the *sleeping effect*, e.g. Gruder et al., 1978; Hannah and Sternthal, 1984; Mazursky and Schul, 1988). In the light of the insufficient prognosis offered by past research regarding the characteristics of processing, following invalidation of previous information, the present study was designed to focus on the search strategies adopted by consumers following the experience of invalidation.

The present study utilizes a version of process tracing models. Process tracing methods have proved useful in decomposing search characteristics in consumer behavior and related areas of inquiry. These models focus on the intervening steps that occur between the introduction of informational inputs and the decision outcomes. In these models "... the algorithms or strategies that people use in arriving at a decision are the main focus of inquiry" (Ford et al., 1989, p. 76). Although they are not limitation-free (e.g. they are basically verbal in format, and all information is equally available, and costly to obtain, see Jacoby et al., 1987 for a detailed discussion) process tracing methods have been successfully utilized in a variety of contexts providing process aspects not typically attainable by most static methods. In particular, the *depth*, *content* and *sequence* measures of search illustrate the diversity of indices that can be extracted from process models.

Search depth. The first measure examined in this paper concerns the *depth* of search, that is, the amount of post-invalidation search. Past research is consistent with the notion that search following invalidation will involve accessing a large amount of information. In considering research in related domains, Chaiken et al. (1989) argued that when the confidence of the decision maker is undermined, he or she will increase effort to enhance judgment certainty. Similarly, it has been suggested that the level of cognitive effort is adjusted in accordance with the purpose of reaching decision certainty (cf. Ozanne et al., 1992). Consumers are willing to search for more information as discrepancy between the original message and the invalidating cue increases and as the perceived cost of making erroneous judgment increases. Accordingly, it is hypothesized that invalid information prompts search: Upon realizing that brand information is invalid,

consumers will engage in more extensive search than those who did not experience information invalidation.

Search content. The second measure concerns the *content* of search. Past research indicated that disconfirmed information becomes more salient. To wit, it was stated that drawing attention to the disconfirmed information is likely to increase the accessibility of the inferences stemming from it (e.g. Higgins and King, 1981; McArthur, 1981). Because disconfirmed information also tends to become more salient (Schul and Burnstein, 1985), it is likely that search will subsequently focus on comparing the invalidated brand with other brands to obtain their values on the disconfirmed attribute. Note that in the case of invalidation, information about other attribute values pertaining to the invalidated brands are already known to the individual when the invalidation cue is received. Thus, it is hypothesized that the invalidated attribute will be scanned more frequently than other attributes.

Search sequence. The latter prediction may also be reflected in another search measure – the *sequence* of search. Past research distinguished between two dominant accessing strategies. Accessing may be primarily alternative-based (or holistic) in which individuals search one alternative at a time centering on its attributes. Alternatively, accessing strategy may be characterized as attribute-based (or dimensional) in which individuals access information for several alternatives on a single attribute alternative-by-alternative and then do the same for other important attributes (e.g. Jacoby et al., 1976). Considering the preference of the invalidated attribute in search, it is suggested that attribute-based strategy will characterize search following invalidation for as long as the search focuses on the invalidated attribute.

On the other hand, however, a rationale for the alternative prediction, namely, that alternative-based processing will characterize search sequence, may stem from analyzing the impact of prior knowledge on search sequence strategy. Prior knowledge was previously shown to be associated with a dominant attribute-based rather than alternative-based accessing (e.g. Bettman and Kakkar, 1977). However, invalidation undermines individuals' knowledge about the brand, simply because after invalidation they "know less" about the brand, to the extent that their perceived capability of adequately performing the search may be impaired. Thus, they may retreat to a less "expert-like" processing. This impact of invalidation of past information, leads to a prediction of a dominant alternative-based rather than attribute-based search. Under these circumstances, it is hypothesized that attribute-based strategy will dominate in the early stages of search (as discussed above) but that overall, a higher proportion of alternative-based compared to attribute-based search, is expected.

In summary, the hypotheses tested in the present research can be stated as follows:

1. Invalidation of previous information prompts search. Consumers experiencing information invalidation will engage in more extensive search than those who do not experience information invalidation.
2. The invalidated attribute will be accessed more frequently than other attributes.
3. Overall, a higher proportion of alternative-based compared to attribute-based search is expected, although attribute-based strategy will dominate in the early stages of search.

2. Study 1

2.1. Methodology

2.1.1. Subjects

One hundred and eighty two undergraduate students enrolled in business courses were invited to participate in a decision-making task. All the participants had prior computer experience of one or two courses in which pcs were used. Subjects were paid for their participation. To enable monitoring and answering questions by the experimenter, subjects participated individually in a computer lab.

2.1.2. The focal product and attributes

A requirement for selecting the focal product was that subjects would be familiar with the product and its attributes though not so familiar as to have extensive attribute knowledge. A focus group drawn from the same population as in the study sample, indicated that personal computers would be a suitable product stimulus for this experiment. The same focus group has also selected the six attributes considered to be most descriptive of pcs for the sampled population. The selected attributes were: hard disk size in megabytes, RAM memory size, screen mode type, length of warranty in months, value of software supplied with the computer, and price of the computer.

2.1.3. Design and procedure

Upon their arrival at the lab subjects were told that they would be participating in a decision-making task concerning the choice of a computer. They were asked to assume that they were planning to buy a computer. After a

	<i>Initial Information</i>	<i>Invalidation Cue</i>	<i>Search</i>	
"Invalidation" Condition	1 (Configurations) X 6 (Attributes)	Warranty Information is Invalidated	6 (Configurations) X 6 (Attributes)	Judgments
"No Invalidation" Condition	1 (Configurations) X 6 (Attributes)		6 (Configurations) X 6 (Attributes)	Judgments

Fig. 1. An illustration of the experimental design: Experiment 1.

short practice run, the computer (named Pro-C) offered by one store appeared on the screen (see Fig. 1 for an illustration of the design). Participants were given the opportunity to request a clarification regarding the definition of each attribute. For instance, the explanation given in response to inquiring about the third (screen mode type) attribute was: "This attribute describes the type of monitor supplied with the computer".² Four available types of monitors were presented, in ascending order of quality.

Two conditions were generated by either conveying the invalidating message (i.e. the "invalidation" condition) or not conveying the invalidation message (i.e. the "no invalidation" condition). The invalidation message was as follows:

"Inquiry at the store revealed that the information concerning the warranty on the computer was incorrect. It was found that the warranty contract with the service company had expired, and that no new contract has yet been signed. At this stage no information regarding the terms of the warranty is available. Therefore, you should ignore the information stating that the length of the warranty period is 30 months."

All the participants were subsequently informed that they could collect additional information in order to arrive at a decision. The message on the

² In addition to the clarification available on the computer, subjects were asked whether they would need more clarification, in addition to the information that was available on the computer. Subjects were generally familiar with these attributes. Only in very few cases have subjects inquired about information beyond that which was presented on the computer. Subjects were also handed blank papers to be used in case they had wanted to make any remarks, in addition to their responses on the computer. These were seldom used and therefore, they were not analyzed.

screen informed them that additional information was available from other stores which also sold the Pro-C computer, but not necessarily with the same configuration as that of the first store.

At each step (defined as one access of one cell), a 6 (stores) \times 6 (attributes) matrix appeared on the screen. The attributes were described in words in randomized order across participants. The stores were denoted only by numbers (whereby store number 1 was the one described earlier). By pressing the number corresponding to the desired attribute and store, the particular cell information appeared on the screen.

2.1.4. *Judgments*

When participants indicated that they were ready to make a decision, two questions appeared on the screen. The first question asked the participants about their intention to buy the computer (ranging from 1 – “Definitely not” to 7 – “Definitely yes”). The second question focused on satisfaction with the warranty (1 – “Not at all satisfied” to 7 – “Very satisfied”). Participants were also asked to indicate their preferred store.

2.2. *Results*

2.2.1. *Amount of information search*

The analysis focused first on the depth of search, i.e., the number of items of information accessed. The hypothesis stated that under the “invalidation” condition, individuals would search for more information than under the “no invalidation” condition. Computation of the number of items of information accessed under the two conditions suggested, though insignificantly, that search was more extensive under the invalidation condition (mean = 11.8 steps) than under the no invalidation condition (mean = 9.5 steps, $t(180) = 1.89$, $p < 0.06$).

2.2.2. *Content of search*

A step by step tracking of the attributes accessed provided the evidence for the hypothesis about the content of search, namely, that the warranty attribute would be accessed more in the invalidation condition. Table 1 shows the ratio of search proportions and Fig. 2 shows the attributes accessed over the first eleven steps, that is, the frequency of accessing the invalidated attribute relative to accessing the other attributes at each step. As expected, the most notable observation in Table 1 concerns the accessing of the warranty information. More warranty information was accessed in the invalidation than in

Table 1
Ratio of search proportions of the invalidation and no invalidation groups

	Store (configuration)						Total
	1	2	3	4	5	6	
<i>Attributes</i>							
Hard disk	1.33	1.21	1.00	0.75	1.45	0.70	6.44
RAM	1.73	1.19	0.85	0.82	0.77	0.93	6.29
Monitor	1.21	0.81	0.61	0.93	1.54	0.97	6.07
Warranty	2.57	3.31	1.23	1.35	1.50	1.53	11.49
Software	1.54	1.16	0.84	1.12	0.58	1.32	6.56
Price	0.73	0.87	0.75	0.70	0.62	0.84	4.51
Total	9.11	8.55	5.28	5.67	6.46	6.29	41.36

the no invalidation condition (accessing proportion was 0.228 in the former and 0.117 in the latter condition, $t(180) = 4.30$, $p < 0.01$). In addition, some differential effect was observed (see Fig. 2) over the course of the search process. The difference in accessing was somewhat more prominent in the early steps of the search process. Accessing of price information showed an opposite pattern (proportions were 0.275 in the invalidation condition and 0.385 in the no invalidation condition, $t(180) = 2.97$, $p < 0.01$). There were no other significant differences with respect to accessing the other attributes. These findings indicate that the invalidated attribute – warranty – was accessed proportionally more, and that accessing that attribute tended to take place before price information.

2.2.3. Accessing sequence strategy

To compare the strategies adopted by participants in forming the judgment, two major types of transitions were identified. The first, accessing an item of information from a different attribute but from the same store as the immediately preceding accessed item (“alternative-based”); the second, accessing an item of information which is from the same attribute but from a different store than the immediately preceding accessed item (“attribute-based”).

Subsequently, the proportions of the accessing types in the entire search were computed. As expected, alternative-based processing was utilized more in the invalidation condition than in the no invalidation condition (the proportions were 0.342 and 0.246 in the two conditions, respectively, $t(180) = 2.14$, $p < 0.05$). Overall then, alternative-based accessing was the dominant strategy.

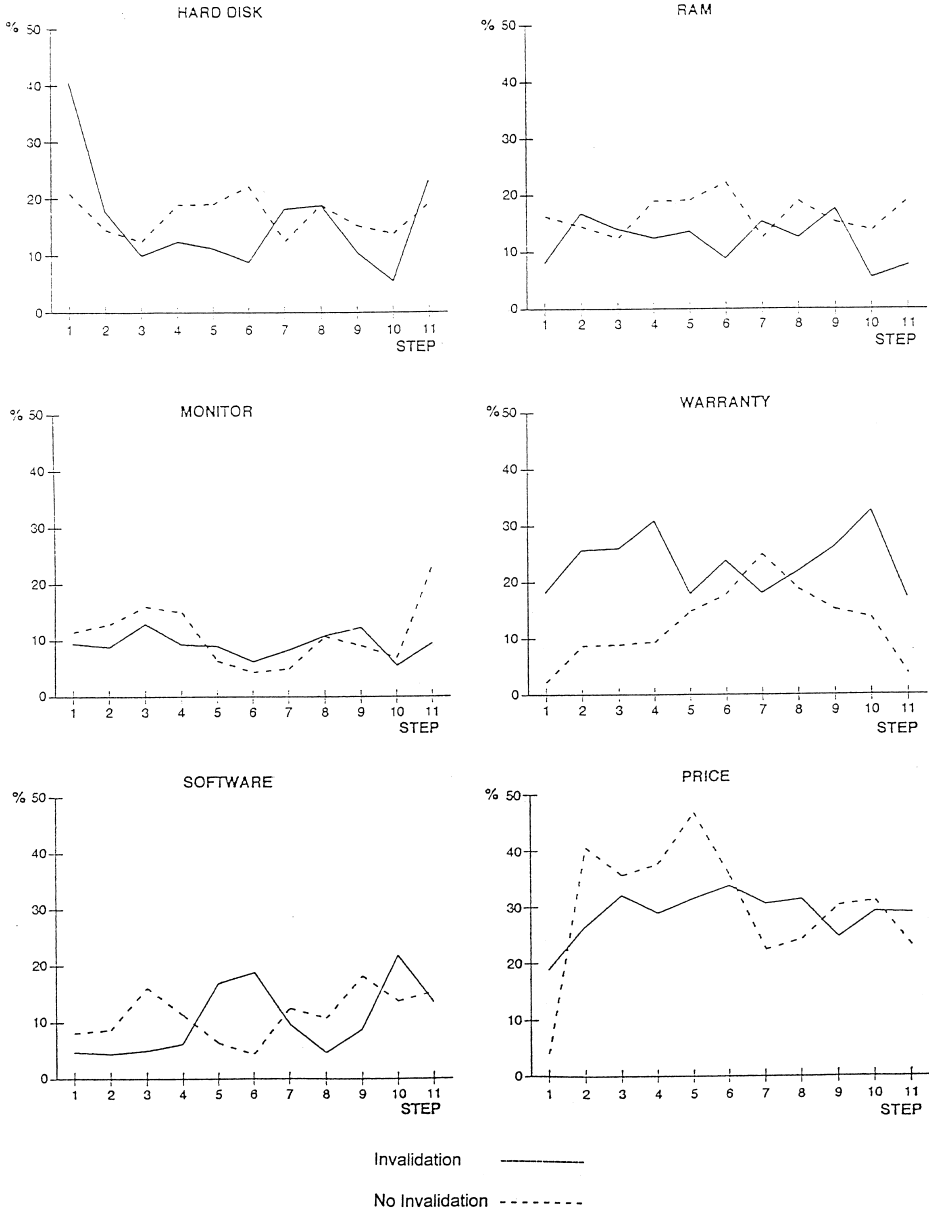


Fig. 2. Step by step attribute accessing comparison.

While alternative-based strategy was dominant when the entire search process was examined, the hypothesis regarding the differential priority, whereby the warranty attribute would be accessed earlier in the task, was more closely examined in Fig. 3. In this figure, the relative priority of accessing warranty information (i.e. relative to accessing it in the remaining steps) was computed. Fig. 3 shows that the subjects in the “invalidation” group tended to access warranty information earlier in the process than did the subjects in the no invalidation group. In sum, the sequence measure findings show that the warranty attribute was examined early in the search (across computer configurations) although overall, the alternative-based strategy was dominant.

2.2.4. Judgments

Two additional measures were collected upon completion of the task. One inquired directly about the invalidated attribute (i.e. warranty satisfaction) and the other one was a global judgment (i.e. intention to purchase). Interestingly, the mean warranty satisfaction for the invalidation group (mean = 4.09) was lower than that of the no invalidation group (mean = 5.18, $t(180) = 5.09$, $p < 0.001$). At the same time no difference was indicated in their global intention judgment (mean = 4.23 vs. 4.57 in the invalidation

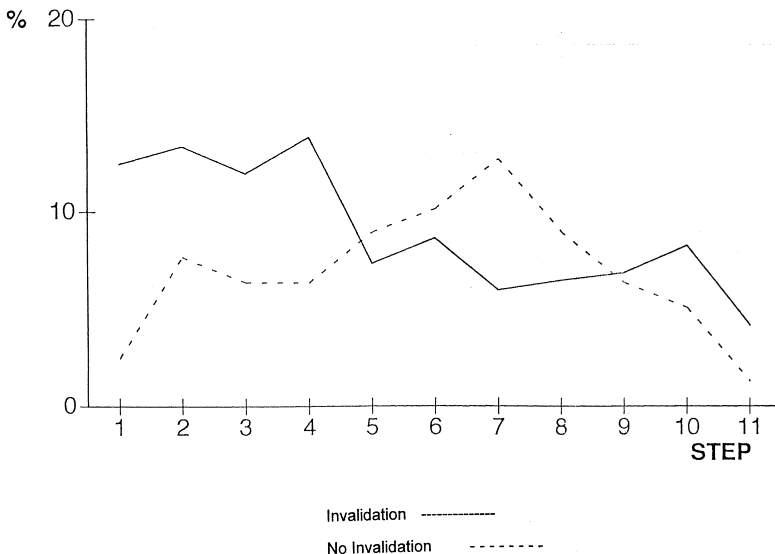


Fig. 3. The relative priority of accessing warranty information.

and the no invalidation, respectively, $t(180) = 1.42$, n.s.). It should be noted that an examination of the judgments vis-a-vis the chosen configuration (i.e. store) indicates that the difference in judgment cannot be attributable to differences in the preferred configuration.

2.3. Discussion

Study 1 focused primarily on the search characteristics following the delivery of an invalidation cue. Several key findings were obtained. First, participants who received the cue tended to search for more information than those who did not receive it. This finding supports the hypothesis that invalidation triggers a process of search in order to improve subsequent judgments.

Second, as hypothesized, it was found that throughout the information search, the invalidated attribute was accessed more by the subjects assigned to the invalidation condition than by those in the no invalidation condition.

Third, the examination of the entire search process showed that participants in the invalidation and no invalidation conditions tended to differ with respect to the search strategy adopted. Those who were assigned to the invalidation group relied more on an alternative-based search strategy orientation relative to their no invalidation counterparts.

Obviously, there is an apparent inconsistency between the second and third sets of results. On the one hand, the invalidated attribute was searched more in the invalidation condition. This implies a superiority of attribute-based search. An examination of the entire search process, however, indicates that alternative-based search was more frequently utilized. Additional examination of the data shows that a change in search sequence during the search itself explains this apparent inconsistency. Subjects tended to begin the search by comparing the computers along the warranty attribute although later, an alternative-based search became dominant.

The enhanced salience of the invalidated attribute is a result of the attempt to improve judgment quality. Did this strategy lead to a search which completely eliminated the effect of the invalid information? Study 1 showed that upon completion of the task, participants indicated lower judgment of the invalidated attribute though no difference was indicated in global (intention) judgments. Yet, additional search along the invalidated attribute should lead to a decrease in the difference in judgments between the beginning and the end of the task. Study 2 was designed to focus on the judgmental processes that complement the observed search pattern. The purpose of Study 2 was to test whether the accessing of additional

information does, indeed, improve judgments and reduce the difference in judgments between the two conditions. It was hypothesized that attribute judgment difference between the invalidation and no invalidation groups will decrease over the search process.

3. Study 2

3.1. Methodology

3.1.1. Subjects

One hundred and twenty undergraduate students enrolled in business courses were recruited by using the same selection criteria as in Study 1. Due to computer malfunctioning the results of two subjects were discarded. The stimulus product and the attributes were the same as in Study 1.

3.1.2. Design and procedure

The instructions and procedure were similar to Study 1 with one exception. To enable comparability of judgments, it was necessary to control for the amount of information acquired by subjects in the judgment stage. Therefore, in Study 2, a forced behavioral process was applied by restricting the search length. Although the number of steps was predetermined, subjects were not aware during the task about the length restriction. The subjects were assigned to four conditions generated by crossing the invalidation factor (i.e. invalidation vs. no invalidation) and the “additional search” factor (enabling vs. not enabling additional search). The selected length for the two “additional search” conditions was chosen to be eleven steps in the light of the rounded mean length obtained in Study 1. A higher number of steps might have biased the analysis because a comparison of judgments can be valid if judgments are based on the same number of accessed items. This comparability might have been seriously undermined if a very large (or unlimited) number of steps was allowed. An illustration of the design is displayed in Fig. 4.

3.1.3. Judgments

Upon completing the task, participants were asked to indicate the store of their choice. In addition, they were asked to indicate their judgments about warranty satisfaction (1 – “Not at all satisfied” to 7 – “Very satisfied”) and intention to buy the computer (1 – “Definitely not” to 7 – “Definitely yes”).

		Initial Information	Invalidation	Search	
Invalidation Condition	Additional	1 (Configurations) X 6	Cue Warranty Information is Invalidated	6	
	Search	(Attributes)		(Configurations)	Judgments
				X 6 (Attributes)	
	No Additional	1 (Configurations) X 6		6	
	Search	(Attributes)	(Configurations)	Judgments	
			X 6 (Attributes)		
		Initial Information	Invalidation	Search	
No Invalidation Condition	Additional	1 (Configurations) X 6	Cue Warranty Information is Invalidated	6	
	Search	(Attributes)		(Configurations)	Judgments
				X 6 (Attributes)	
	No Additional	1 (Configurations) X 6		6	
	Search	(Attributes)	(Configurations)	Judgments	
			X 6 (Attributes)		

Fig. 4. An illustration of the experimental design: Experiment 2.

3.2. Results

An ANOVA was applied with Invalidation and Additional Search as independent factors. In the first analysis, the dependent judgment was the invalidated attribute, namely, warranty satisfaction. Within the “no additional search” condition, the mean judgment was 3.56 in the invalidation condition and 5.92 in the no invalidation condition. This difference decreased when

additional search was permitted (mean = 4.00 and 5.07 in the invalidation and no invalidation conditions, respectively). A main effect due to invalidation ($F(1,114) = 20.3$, $p < 0.001$) and the significant interaction effect ($F(1,114) = 4.01$, $p < 0.05$) provided support for the contention that the invalidation effect would be strongest immediately following the receipt of the invalidation cue, and subsequently decreased with the acquisition of additional information. The main effect due to additional search was not significant ($F(1,114) = 0.33$, n.s.).

Analysis of the simple effects indicated that despite the significant interaction, the difference between the invalidation and no invalidation groups at the end of the task was still significant ($F(1,114) = 9.36$, $p < 0.01$). This finding replicates the difference obtained in Study 1.

The analysis was subsequently performed with the global (intention) measure as the dependent variable. The mean measures within the “no search” conditions were 3.93 in the invalidation condition and 4.83 in the no invalidation condition. Within the “search” condition the two means were 4.27 and 4.57 for the two conditions, respectively. The effect due to invalidation was marginally significant ($F(1,114) = 3.11$, $p < 0.08$). The effects of both search and the interaction were not significant.

3.3. *General discussion*

Past research, focusing primarily on spontaneous post invalidation judgments pertaining to a single alternative, indicates that the invalidating cue does indeed affect the judgment regarding the invalidated attribute as well as global judgments. The present study suggests that extending this paradigm by enabling individuals to acquire more information can contribute to the understanding of the processing of invalid information. This extension is important given that, in reality, active information search and information processing continue beyond the cue delivery stage. For instance, a message regarding the non-validity of the warranty of a specific computer does not typically undermine the need and willingness to purchase a (i.e. this or any other) computer. Consumers will continue searching and comparing until a satisfactory decision will be reached. The present simulated search demonstrates that following the processing of an invalidating cue, consumers strive to actively restore their information base in order to be able to make a better judgment.

The salience of the invalidated attribute also affects the search strategy. The findings show that the values of the invalidated attribute were accessed

first. When the invalidated attribute is highlighted, attention is focused on the attribute values of the various alternatives. Such a search strategy also alleviates attribute level uncertainty about the validity of other alternatives. This implies an attribute-based accessing strategy.

On the other hand, analysis of the search sequence for the entire search process indicates that, overall, the strategy adopted tended to be alternative-based. Obviously, this apparent inconsistency stems from the conflicting factors affecting the selection of a strategy. While one factor relates to the salience of the invalidated attribute, the other factor results from the impact of the invalidation cue on the organization of product related knowledge.

Interestingly, the salience of invalidated information is not only reflected in the depth of search. Study 1 and Study 2 show that even at the end of the search task, the evaluation of the disconfirmed attribute (warranty) was lower in the invalidation group, despite the fact that information acquisition of additional information was possible. This may indicate that salience of the invalidated attribute was associated with suspicion about the other alternatives. It did not only direct the search pattern, but also primed their evaluations.

While the findings of the present study confirm some key propositions put forward in past invalidation research, a limitation is worth noting. The salience of the invalidated alternative which is extended to the remaining alternatives, may not have an enduring effect on the centrality of this attribute. If level of centrality is conceptualized as the number and strength of associations between the invalidated attribute and other attributes, it is unclear whether such derived salience also increases centrality. Future research ought to focus on this issue since the understanding of salience and centrality effects could prove useful in the development and revision of marketing strategies.

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