The Moderating Influence of the Level of Consumer Knowledge on the Retrieval of Brand Information

by

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A thesis submitted in conformity with the requirements for the degree of Doctorate of Philosophy
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ABSTRACT

A necessary condition for brand choice in memory-based decision making is the retrieval of brands from memory. The set of brands retrieved for choice may be formed at encoding and retrieved on each choice occasion, or formed at retrieval by searching through memory for the most appropriate brands. The results of the first study indicate that low knowledge consumers form a set of brands at encoding to be recalled regardless of the retrieval situation, and that high knowledge consumers form the set at retrieval using the information available in the retrieval setting to recall the most appropriate brands for that setting.

It is hypothesized that at encoding low knowledge consumers use the encoding setting to form a list of brands. Low knowledge consumers link the brands to the learning episode without integrating any of the attribute or usage situation information. The results of the second study show that low knowledge consumers demonstrate primacy effects in recall. These effects are expected when individuals do not integrate information during encoding. High knowledge consumers do not demonstrate primacy effects.

It is hypothesized that at encoding high knowledge consumers integrate brand information into a network of brands, attributes and usage situations. At retrieval they use the attributes most useful for the usage situation to guide brand retrieval. The third study demonstrates that high knowledge consumers find it more difficult to retrieve brand information as the number of unrelated attributes linked to a brand increases or as the number of unrelated brands linked to a usage situation increases. These effects
are common when information is integrated into an associative network. Low knowledge consumers do not demonstrate these effects.

The results of these studies support the general hypotheses that: 1] High knowledge consumers integrate information at encoding which facilitates a search through memory for the most appropriate brands at retrieval, and 2] Low knowledge consumers do not integrate brands at encoding; they form a list of brands based on the encoding situation and recall the list when a decision in the product category is to be made.

The results are discussed, the implications for marketing are presented and ideas for future research are provided.
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CHAPTER ONE

The Moderating Influence of the Level of Consumer Knowledge on Brand Retrieval

1 INTRODUCTION

When making a brand choice, consumers often rely on memory to construct a set of alternatives. They are faced with the task of retrieving brands whenever brand information is not available in the choice environment. A typical example of memory-based choice is the selection of a restaurant. Consumers usually do not consult an external source for possible alternatives when deciding where to have dinner, instead they retrieve a set of alternative restaurants from memory. In this situation, a brand must be retrieved from memory before it can be chosen.

Even though understanding brand retrieval is very important, surprisingly little research has been directed toward understanding the processes involved in brand retrieval (for exceptions see Nedungadi 1990; Hutchinson, Raman and Mantrala 1994). There are two reasons why the reliance on memory in choice settings is important for predicting and understanding consumers' choice behaviour. First, the brands that will be retrieved in a given situation are often difficult to predict. Consumers may not always retrieve the 'best' or 'most appropriate' brands. This is detrimental to the consumer because it means that the most suitable brands may be eliminated before choice, and to the marketing firm as it "imposes a cost on producers because it diminishes the effectiveness of their marketing actions" (Hutchinson, Raman and Mantrala 1994, page 441). Second, the composition of the retrieved set of brands provides a context for the
evaluation of the brands (Dacin and Mitchell 1997). For instance, if the target brand is medium priced, but the rest of the brands retrieved are less expensive, the target brand will seem relatively expensive. In another situation, the target brand and other more expensive brands may be retrieved, in which case, the target brand will seem relatively inexpensive even though the price is the same. Clearly, understanding the determinants of brand retrieval is important to marketing academics and practitioners.
2 RETRIEVAL IN MEMORY-BASED CHOICE

The first stage in memory-based decision making is the retrieval of a set of brands from memory. Consumer behaviourists typically use two approaches in the modelling of brand retrieval for choice. In the first retrieval model, consumers have a set of acceptable brands stored in memory. This set is composed of familiar brands that have been considered earlier and deemed to be acceptable (Howard and Sheth 1969). Membership in this set of brands does not vary in the short-term and, therefore, results in the retrieval of the same brands on each choice occasion.

In the second retrieval model, the consumer constructs a set of brands by searching through memory for the most appropriate brands given the retrieval situation. When cues in the retrieval environment prime the brand, the brand becomes more accessible and, therefore, more likely to be retrieved from memory (Ratneshwar and Shocker 1991). For instance, when a consumer needs a bottle of wine for a dinner at their bosses home, the search through their memory for brands might begin with the attributes of reputation, high quality, and label design. On the other hand, when a consumer needs a bottle of wine to drink at home with spaghetti, the search through their memory may begin with the attributes of inexpensive, and Italian. The result is that the set of brands retrieved from one occasion to the next may vary greatly depending on how much the occasions vary in 'benefits sought'. A necessary condition for this varied retrieval set is that the consumer creates links between brands, attributes and benefits during learning. The creation of links facilitates memory search because brand retrieval is determined by the strength of the links between attributes appropriate
to the retrieval setting and the brand. How and when links are created will be discussed in detail in section three.

To predict which brands will be retrieved, it is necessary to consider when the retrieval set is formed - at encoding or at retrieval. The next sections discuss the encoding explanation of retrieval set formation and the retrieval explanation of retrieval set formation.

**The Encoding Explanation**

The encoding explanation is that consumers learn and recall brands that are important to the encoding situation. Previous research results indicate that individuals use the encoding situation to designate what aspects of the information are relevant (Ausubel 1963; Chiesi, Spilich and Voss 1979; Spilich, Voss, Vesonder and Chiesi 1979), or to direct attention to specific details in the material (Spilich, Voss, Vesonder and Chiesi 1979). Information that is the focus of attention is most likely to be available for retrieval later.

Studies demonstrating that consumers recall brands preferred at encoding (Hauser and Wernerfelt 1990; Roberts and Lattin 1991) or that are relevant to a usage situation at encoding (Huffman and Houston 1993), offer evidence supporting the encoding explanation. In Hauser and Wernerfelt (1990) and in Roberts and Lattin (1991), brand retrieval depends on brand utility. In Huffman and Houston (1993) brand retrieval is determined by how suitable the brand is to the goal at encoding. In this study, however, the number of brands recalled varied depending on the similarity between the encoding situation and the retrieval situation. Imagine that a consumer
considers four brands particularly appropriate to the goal at learning and two others somewhat appropriate. If the goal at retrieval is the same as the goal at encoding, then all six brands will be retrieved. If the goal changes between encoding and retrieval, then some of the four most appropriate will be retrieved. These cases are consistent with the encoding explanation because retrieval is simply a process of locating a set of brands identified as important at encoding. Variation may occur in the number of brands recalled, and in Huffman and Houston, in the relative probabilities of recall.

The Retrieval Explanation

The retrieval explanation is that consumers recall brands important to the retrieval situation. A few studies in the text comprehension and recall literature offer compelling demonstrations of the retrieval explanation (Anderson and Pichert 1978; Pichert and Anderson 1977). In these studies subjects read a story and try to recall the text using different retrieval cues. As the retrieval cues change, different aspects of the story become relevant and, therefore, more accessible for recall (Anderson and Pichert 1978; Anderson, Pichert and Shirey 1983; Mandler and Johnson 1977; Pichert and Anderson 1977).

Reconciling the two Approaches

To better understand whether consumers retrieve a set of brands constructed at encoding for memory-based choice or whether they search through memory at retrieval requires an investigation of: 1] when the retrieval set is formed (at encoding or at retrieval) and 2] the nature of the variation in the set of brands retrieved. The research reported here helps to reconcile when the set of brands is constructed by investigating
how the level of previous product knowledge moderates the retrieval process. The hypotheses assert: 1] that the level of product knowledge determines how well-integrated newly acquired brand information is, and 2] that it is the degree of integration (whether links are created in memory between brands, attributes and usage situations during encoding) that determines when the set is formed. This research uses an associative network model (Anderson 1983) as a representation of how information is structured in memory, and how information is retrieved from memory. The following sections include a description of associative network models, and a review of the relevant research on the differences in decision making for high and low knowledge consumers.
3 ASSOCIATIVE NETWORK MODELS

Network Structure

In network models of memory (see Anderson 1983a; Collins and Loftus 1975), nodes in a network represent concepts such as brands, attributes and usage situations. The links that connect the nodes represent the type and the strength of the association between the concepts. Stimulating a node results in a flow of activation to all connected nodes. When activation of a node surpasses the threshold level, retrieval of the concept will occur. To put the model into a consumer context, if a usage situation activates an attribute or attributes, activation will continue to spread to all the brands connected to the attributes. If the resulting activation of a brand is sufficiently high, retrieval of that brand occurs. For instance, in the wine example above, brands of wine (brand nodes) are associated (linked) to attributes (attribute nodes) such as dryness, country of origin, vintage, reputation, price and type of grape. Some of these attribute nodes might be strongly associated with certain types of food, company and dinner settings (usage situation nodes). If you are invited to your boss's home for a semi-formal barbequed dinner (a usage situation node) then activation might spread to certain attribute nodes - dry, full-bodied, Australian red wine with a reputation for high quality. These attribute nodes will be associated to certain brands. The brands with the highest activation levels, assuming they surpass the threshold level, will be retrieved.

Figure One illustrates the structure of information in a network model. When a consumer learns about a brand, they may integrate the information by brand, by

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attribute, or by both brand and attribute. Integration by brand describes a process of creating links between a brand and the newly learned attributes or benefits. For instance, in Figure One brand integration occurs after learning that brand B offers attribute 2 and attribute 4. An example of this is learning that Wolf Blass Shiraz, an Australian red wine, is highly regarded for its robust flavour, and then later learning that 1993 was a particularly good year for that wine. Integration by attribute describes the process of creating links between an attribute and the brands that are perceived to have the attribute. For instance, in Figure One attribute integration occurs after learning that brand C also has attribute 4. Note that an indirect link through attribute 4 now connects brand B and brand C. An example of this is learning that 1993 was a good year for both Wolf Blass Shiraz and Peter Lehman Pinot Noir.

figure one about here

Integrated Structures (networks) versus Unintegrated Structures (lists)

Knowledge structures may differ in the extent to which they are integrated. A well-integrated knowledge structure is one where there are linkages between all, or most of the brands, attributes and usage situations. The linkages between the attributes and the usage situations reflect an understanding of which attributes are important for a particular usage situation.

A less integrated structure contains fewer links between the brands, attributes and usage situations. The links are less likely to connect attributes to usage situations,
and more likely to connect brands to the learning episode. In other words, in a less integrated structure, the consumer is not as likely to link two brands of wine to the 1993 vintage information, and more likely to link the brands to the 'trip to the wine store last weekend' node (in this case, the learning episode). The resulting structure resembles a list. In the wine store example, it may be a list of red wines that were mentioned by the clerk in the wine store. In a marketing study a subject may link the brand information to 'things I learned in the lab today'. The subject links each brand to the episode without creating links to other instances in the list. The structure is a list of facts presented at study, instead of a complex network of associations.

**List Structure**

Figure Two illustrates the formation of a list structure. As a consumer learns about brands, links are created between brands and the learning episode without integrating over brands, attributes and usage situations. Attributes about the same brand remain as two independent pieces of information linked to the learning episode. For instance, when a consumer speaks to a salesperson about wine, the consumer links all the brands to the learning episode without integrating over brand or attribute. If a consumer learns that brand A has attribute 1, and later learns that brand A also has attribute 3, the two attributes will not be indirectly linked through the brand A node (or integrated by brand). Instead, two links will be created between the learning episode and brand A. The structure does not change because both attributes relate to the same brand.
If a usage situation is present during encoding, the strongest links from the brands to the learning episode will be between the brands most appropriate or relevant to the usage situation. In figure two, a strong link between the learning episode and brand A would be created if usage situation 1 was present during encoding. Every time the learning episode is cued or activated, activation will spread to brand A, resulting in its inclusion in the set of retrieved brands.

In summary, more or less integrated structures of brand information differ in configuration, and the number of links between the nodes. A discussion of the differences in the organizational structure of information in memory for high and low knowledge consumers, and how the structures affects the process of retrieval, is included in the next section.
4 HIGH AND LOW KNOWLEDGE INDIVIDUALS

The amount of knowledge and experience an individual has in a domain has been recognized as an important determinant in memory performance since deGroot (1966), and Chase and Simon (1973), found memory differences between expert and novice chess players. Consumer researchers have also reported memory differences between consumers with more or less knowledge about a product, as well as other decision relevant differences. For instance, the level of product knowledge affects how much information is sought (Johnson and Russo 1984), which brands should be searched (Biehal and Chakravarti 1986; Brucks 1985), how much processing of available information occurs (Bettman and Park 1980), how alternatives are evaluated (Bettman and Sujan 1987; Sujan 1985), and how goals influence learning (Huffman and Houston 1993).

Of particular interest here is the investigation of the relation between knowledge level and memory for new information about brands. This is an area where less is known about the differences between high and low knowledge consumers. Alba and Hutchinson (1987) review the existing research thoroughly and present many hypotheses for the differences in the memory performance between high and low knowledge consumers, most of which have not been tested.

Some relevant research results have been reported, however. High knowledge consumers are able to recall more brands than low knowledge consumers (Alba and Chattopadhyay 1985; Bettman and Park 1980; Hutchinson 1983). The advantage of the high knowledge consumer in recalling previously presented brand information is
exaggerated when the presentation format is random instead of blocked (Srull 1983). Presumably, low knowledge individuals find it difficult to organize the product information at learning, while high knowledge individuals are able to use schemas stored in memory to guide the organization of new information (Chiesi, Spilich and Voss 1979; Voss, Vesonder and Spilich 1980). Alba and Hutchinson (1987) hypothesize that high knowledge consumers use their knowledge to identify what information is important for consumer decisions. "Due to their superior ability to distinguish between relevant and unimportant product information, experts should recall a greater amount of important and decision-relevant information" (page 433). In other words, high knowledge consumers not only recall more information, but recall more useful information for decision making because they are able to use the content and the organization of their knowledge to guide encoding and retrieval.

There are relatively few empirical investigations of the differences in the organization and content of knowledge between high and low knowledge consumers (for exceptions see Hutchinson 1983; Mitchell and Dacin 1996). There are some results, however. When learning new information consumers that rate themselves as high knowledge consumers, and have knowledge of the characteristics of a product are more likely to draw comparisons between brands (Mitchell and Dacin 1996). More comparisons will result in more associative links between brands. Mitchell and Dacin (1996) also found that the number of associative links between brands and attributes increase with product knowledge, and that consumer's with more knowledge are more likely to represent the level of the attribute, instead of just the presence of the attribute.
The additional information about the quantity of an attribute presents further opportunity for integration, as relations between brands may also be based on the level of an attribute instead of just its presence. Taken together, high knowledge consumers should have a more complex network of links between brands and attributes.

High knowledge consumers possess more integrated knowledge structures, as is represented in the associative network model discussed earlier. Well-integrated knowledge structures are a necessary condition for the construction of a set of brands at retrieval. Low knowledge consumers are more likely to have list-like, less integrated structures. The low knowledge consumer may organize their knowledge around the learning episode, and the brands with the strongest associative links to the episode are most likely to be recalled. Less integrated, list-like structures are more likely to result in a retrieval process described by the encoding explanation.
5 EMPIRICAL INVESTIGATIONS

The next three chapters describe a series of empirical studies investigating how the level of knowledge of a consumer affects the amount of integration during encoding, and how that integration influences the process of brand retrieval. Study One tests for differences in the brands recalled as the encoding and the retrieval situations vary. Studies Two and Three investigate whether it is the degree of integration during encoding that explains the results of Study One. Study Two is designed to test whether low knowledge consumers encode facts about brands without integrating the information during encoding. Study Three is designed to test whether high knowledge consumers integrate facts about brands over attributes and usage situations when encoding new brand information.

Study One

The first study examines the effect of a usage situation on the encoding and retrieval of brands from memory. When presented with information about new brands, it is hypothesized that high knowledge consumers integrate the information into a network structure. At retrieval they search through memory for brands linked to a particular usage situation. Low knowledge consumers organize the new information in a list format associated to the learning episode. Regardless of the usage situation at retrieval, the low knowledge consumer retrieves the same set of brands.

This study builds on an experimental design used by Anderson and Pichert (1978) in their work examining how schemas direct the search through memory during retrieval. In Study One, the encoding setting is manipulated by either providing
subjects with a usage situation or not providing them with a usage situation. The retrieval setting is manipulated by providing the subjects with different usage situations. When more brands appropriate to the usage situation at retrieval, and fewer brands appropriate to the usage situation at encoding are recalled, the subject is constructing a set of brands during retrieval. In other words, the subject is using the usage situation at retrieval to initiate a spread of activation from the usage situation to the brands and attributes. When more brands appropriate to the usage situation at encoding, and fewer brands appropriate to the usage situation at retrieval are recalled, the subject is retrieving a set of brands constructed at encoding. In other words, the subject is using the usage situation at encoding to construct a set that is later recalled regardless of the setting at retrieval.

It is hypothesized that high knowledge subjects retrieve a varied set of brands. The hypothesis is based on the assumption that high knowledge subjects use the usage situation at retrieval to initiate a spread of activation allowing them to retrieve the brands most appropriate to the retrieval situation. It is also hypothesized that low knowledge subjects retrieve the same set of brands, regardless of the retrieval situation. This hypothesis is based on the assumption that low knowledge subjects just retrieve the set of brands stored together at learning because of their perceived importance to the encoding situation.

The study is designed to test the hypotheses, but not the assumptions they are based upon. For this reason, alternative explanations may be offered to explain the results of the study. Studies Two and Three are designed to: investigate the
assumptions, test the integration explanation offered in this thesis and eliminate any alternative explanations.

**Study Two**

Study Two further investigates the reliance of the low knowledge consumer on the learning episode when encoding brand information. In this study there are no usage situations to guide encoding. The design of Study Two borrows from a long tradition of research on list learning and presentation order effects. Studies in cognitive psychology indicate that when the opportunity to integrate the material on a list is minimized, the probability of recalling the first items in a list is greater than the probability of recalling the rest of the items, i.e. primacy effects (some examples are Craik and Watkins 1973; Rundus, Loftus and Atkinson 1970; Sato 1990). In Study Two, subjects are presented with lists of brand-attribute claims. If the new information is not integrated, then subjects should be more likely to recall the first few items on the list than the remaining items. If the new information is integrated, then the probability of recalling an item will be unrelated to presentation order. Therefore, primacy effects in recall are expected for low knowledge subjects, but not for high knowledge subjects. The study also investigates whether subjects, specifically low knowledge subjects, link brands to the learning episode.

**Studies Three and Three A**

Study Three and Study Three A further investigate whether the consumer's knowledge level affects how and when new brand information will be integrated. High knowledge consumers are hypothesized to be more likely to integrate information
Knowledge Levels and Brand Retrieval

during encoding than low knowledge consumers. These studies are designed to test whether knowledge level and the type of information affect the amount of integration.

In these studies the dependent measures are time required to make recognition judgments and the accuracy of the judgments. Elsewhere, high and low knowledge consumers have been reported to perform equivalently on recognition tests (Alba 1983; Alba, Alexander, Hasher and Canaglia 1981; Chiesi, Spilich and Voss 1979). The accepted explanation is that recognition performance is less dependent on search, and therefore, any advantage a high knowledge consumer enjoys in recall will decline considerably during recognition. However, other recognition models (Mandler 1980 for example), include search in the recognition process. Further, research investigating associative network models uses recognition as the dependent measure to investigate structural differences in newly acquired knowledge. The premise for Studies Three and Three A is that although there may be no difference in overall recognition performance, significant differences in recognition will be observed when more attributes are learned about a brand, or when the attributes are related to the same usage situation.

In these studies, subjects see brand information that varies in the number of attributes that are associated to a brand or the number of brands that are associated to a usage situation, and in how related the attributes are to a usage situation. If the information is integrated, it will be more difficult to recognize a particular attribute as the number of unrelated attributes increases (the fan effect in Anderson 1974; 1976; Anderson and Bower 1973), and less difficult as the number of related attributes increases (Reder and Anderson 1980; Smith, Adams and Schorr 1978). If information
is not integrated, then the manipulations should have little effect on recognition performance.

The pattern of the associative links in the structure of a consumer is investigated by examining both the ability to recognize previously seen information, and the ability to identify new information. A discussion of different strategies for retrieval follows the reporting of the results.
6 THESIS OBJECTIVES

The objectives of this thesis are twofold. The first objective is to investigate whether high knowledge consumers integrate incoming information over brands, attributes and usage situation, and whether low knowledge consumers simply link information to the learning episode. The second objective is to better specify how the retrieval process differs in consumers with more or less product knowledge. Specifically, the aim is to understand when the retrieval set is constructed: at encoding or at retrieval.
CHAPTER TWO

Retrieval Set Composition: Reconciliation of the Encoding Explanation and the Retrieval Explanation

1 INTRODUCTION

In Chapter One, two types of retrieval sets were discussed: a set constructed at encoding and a set constructed by searching through memory at retrieval. When the retrieval set is constructed at encoding, it is more likely to be composed of the same brands on each retrieval occasion. When the retrieval set is constructed at retrieval, it is more likely to include different brands on each retrieval occasion.

There are two reasons why the retrieval set might vary over retrieval occasions. If the consumer searches through memory for brands that are appropriate given the retrieval situation, then variation will occur as the retrieval situation changes. For instance, imagine two different retrieval situations, in the first 'reliability' and 'durability' are the most important attributes, while in the second 'trendiness' and 'attractiveness' are the most important attributes. The brands included in the retrieved set will vary if the brands associated to the attributes, or the strength of their association to the attributes, are different. It could happen that none of the brands retrieved in the first scenario are retrieved in the second scenario. This is consistent with the retrieval explanation of retrieval set formation because the set is formed at retrieval.

If the consumer simply searches through memory for a set of brands stored previously, then variation will occur if the consumer decides to retrieve a different number of brands. For instance, on one occasion it may be necessary to evaluate a
number of brands. In this case, the consumer may retrieve the five most preferred brands in the set. On another occasion the consumer may limit the decision making to three brands. In this case, three of the most preferred brands in the set will be retrieved. Although there is variation in the brands in the retrieved set, the brands retrieved in the second instance are a subset of the brands recalled in the first instance. This is consistent with the encoding explanation of retrieval set formation because the set that is retrieved is formed at encoding.

The objective of this research is to investigate the conditions that determine whether the retrieval set is decided at encoding or at retrieval. The discussion that follows offers a reconciliation of the explanations based on the organization of newly acquired brand information in memory and the level of product knowledge held by the consumer.

**Necessary Conditions for the Two Approaches**

The conditions determining when the usage situation, present either at encoding or at retrieval, affects brand recall have not been well specified. Here it is argued that the influence of a usage situation is moderated by the organization of brand information in memory.

It is assumed in the retrieval explanation that the consumer is able to use the usage situation to guide a search through memory to identify the most appropriate brands. Not all memory structures, however, facilitate such a search. To be able to use a usage situation, and the attributes important for that situation, to identify the most appropriate brands requires the formation of links between brands, attributes and usage
situations. Therefore, a knowledge structure with a network of linking between brands, attributes and usage situations is a necessary condition for the retrieval explanation of brand retrieval.

When the usage situation at encoding determines brand retrieval, the consumer is less dependent on the links between brands, attributes and usage situations. The consumer is simply using the usage situation at encoding to identify the 'best' brands for membership into the set of relevant brands. The emphasis on the relation of brands to the encoding situation is a necessary condition for the encoding explanation of brand recall.
2 ENCODING: WHAT DETERMINES THE TYPE OF PROCESSING?

Whether a consumer integrates information over brands, attributes and usage situations (integrative processing) or whether the consumer associates the information to a learning episode (episode-based processing) depends on the individual consumer and their ability to 'see' and understand the relations between brands.

Integrative processing requires that a consumer process not only information about the brand itself, but also information about how the brand relates to other brands. In other words, the consumer must use their existing knowledge and their understanding of the brands and attributes to create links that are not explicitly presented in the brand information. Clearly, integrative processing requires a substantial amount of cognitive resources. If a schema is available to assist in identifying similarities between the brands, then integrative processing requires less effort (Kintsch and Young 1984; McDaniel, Einstein, Dunay and Cobb 1986). This is consistent with previous discussions on the role of existing knowledge structures in the organization and learning of new information (Ausubel 1963; 1968; Bartlett 1932; Bettman 1979; Chiesi, Spilich and Voss 1979; Srull 1983; Voss, Vesonder and Spilich 1980).

Episode-based processing occurs when a consumer processes information both about the brand itself, and about the brand's relevance to the learning episode. In this case, each brand is considered independent of any other brands presented at the same time. The objective in episode-based processing is to use the information in the learning environment to guide processing. Results reported by consumer researchers
demonstrate that low knowledge consumers (LKC) use explicitly stated goals or usage situations (Huffman and Houston 1993) or the presentation format during encoding (Biehal and Chakravarti 1982) to guide processing.

In summary, the type of processing depends on the individual who is processing the information and their ability to 'see' the relation between brands, attributes and usage situations. If the individual has well-integrated knowledge structures, integrative processing is more likely. If the individual has less integrated knowledge structures, episode-based processing is more likely.
3 RETRIEVAL: THE PROCESS OF BRAND RECALL

It is the organization of information in a consumer's memory that determines whether retrieval is a process of searching through memory for the most relevant brands, or simply retrieving a set of previously learned brands. The sections following include a discussion of how brands are retrieved from a complex network of product related associations and how brands are retrieved from a list-like structure.

The Associative Network Structure

In network models of memory (see Anderson 1983a; Collins and Loftus 1975) nodes in a network represent concepts such as brands, attributes and usage situations. Links that connect the nodes represent the type and strength of the association between the concepts. Activating a concept node results in a flow of activation to all connected nodes. When activation of the brand node surpasses a threshold level, the brand will be retrieved (see Chapter One for a full explanation).

When the structure is the result of integrative processing. For a consumer, a usage situation may activate an attribute or a set of attributes. Activation will continue to spread to brands connected to the attribute or attributes. For instance, if a consumer needs a bicycle for transport in a city s/he might think about safety and durability. Attributes activated at retrieval might be tire width, safety features and the warranty package. Activation spreads from these attributes to the brands strongly associated to them. When the activation level for these brands exceeds the threshold level, they are retrieved. If the consumer needs a bicycle for tours with a bike racing club, s/he might think about the speed of the bicycle. Attributes activated at retrieval might be frame...
material, wheel diameter and aerodynamic features. Activation spreads from the attributes to the brands most strongly associated to these attributes. When the activation level for these brands exceeds the threshold level, they are retrieved. If different usage situations activate exactly the same attributes, then the same set of brands will be retrieved. If the usage situations activate different attributes, activation will spread along different links and the set will be composed of different brands. Brand retrieval varies with the source of activation and the associative links that guide the spread of activation.

A necessary assumption for this model of the retrieval process is that consumers have elaborate networks of brands, attributes and usage situations. However, if the consumer only has information about a small number of brands in memory, retrieval of all the brands may occur regardless of the situation.

**When the structure is the result of episode-based processing.** Simpler knowledge structures may exist in memory. When the information is not integrated as described above, but instead is associated just to the learning episode, the links from the brand connect to the episode only. In this case, the structure resembles a list. For instance, in a marketing study a participant may organize information as “things I learned in the lab today”. The subject links each instance to the episode without creating links to other instances in the list. The structure is a list of facts presented at study, instead of a complex network of associations. This structure allows for variation in the strength in the links between brands and the learning episode such that the
probability of brand retrieval varies. The probabilities however, are relatively invariant over retrieval occasions.

When the links between the brands, attributes and usage situations are weak, the source of the activation of the product category may be the event - 'a time you learned something about the product category'. Activation of the episode results in the retrieval of the brands most relevant to the encoding setting, regardless of the importance of the brands' attributes to the retrieval setting.

**Retrieval and Consumer Knowledge**

Whether the same set of brands will be retrieved every time, regardless of the usage situation, or whether a set of brands relevant to the usage situation at retrieval will be retrieved depends on how the information about the brands is structured in memory. More knowledgable consumers will have complex knowledge structures with more links between brands, attributes and usage situations (Alba and Hutchinson 1987; Chi, Feltovich and Glaser 1982). When a usage situation or an attribute is activated at retrieval, the brands linked to the activated nodes are more likely to be retrieved. Consequently, brands more appropriate for a usage situation are more likely to be retrieved.

LKCs do not have knowledge structures that help to interpret attribute information about brands, since they rely on episode-based processing. During encoding, LKCs process information literally (Chi, Feltovich and Glaser 1982; Maheswaran and Sternthal 1990), and process each piece of information independently (Murphy and Wright 1984; Srull 1983). This type of processing does not foster the
integration of new information, and a simple list structure is the result. When this sort of structure exists, retrieval is simply a process of accessing the appropriate list. Retrieval probabilities are relatively invariant over retrieval situations, particularly in the absence of new information.

In summary, high knowledge consumers (HKCs) use the information present at retrieval to initiate the spread of activation through an elaborate network of brand-attribute-benefit associations. This network is the result of integrative processing and allows the HKC to retrieve brands most appropriate to the retrieval situation. LKCs identify the episode in which information was accumulated and access the set of brands associated to that episode. The set of brands or list structure is the result of episode-based processing at encoding. In the absence of new information, the retrieval set will include the same list of brands upon each activation of the category.
4 HYPOTHESES

The research hypotheses are:

H1: Low knowledge consumers construct retrieval sets at encoding and, therefore, will be more likely than high knowledge consumers to recall brands that are relevant to the usage situation present during encoding.

H2: High knowledge consumers construct retrieval sets at retrieval and, therefore, will be more likely than low knowledge consumers to recall brands that are relevant to the usage situation present during retrieval.
5 OBJECTIVES AND DESIGN OF THE EMPIRICAL WORK

Objectives and Introduction

This study investigates whether the retrieval set is constructed during encoding or during retrieval. Specifically, the study tests for the influence of a usage situation at encoding and at retrieval, on brand recall, as well as whether there is a moderating effect of the level of consumer knowledge. A substantial amount of empirical evidence suggests that the probability of recalling a piece of information is related to the perceived importance of that information (Anderson and Pichert 1978; Kintsch and Van Dijk 1978; Voss, Vesonder and Spilich 1980). If the recalled brands are important to the usage situation at encoding, then the set was constructed at encoding. If the recalled brands are important to the usage situation at retrieval, then the set was constructed at retrieval.

To investigate whether a usage situation at encoding will guide processing and the construction of a retrieval set, there are two encoding conditions. Subjects are either provided with a usage situation when they are encoding brand information, or they are not. Later, when retrieving the information, those that were not provided a usage situation at encoding are provided one at retrieval. If the retrieval set is constructed at encoding, then the brands recalled will be appropriate for the usage situation when it was presented at encoding, but not appropriate if it was presented only at retrieval.

The design includes a within subject manipulation to investigate whether a usage situation at retrieval guides memory search each time brand information is retrieved.
from memory. A new usage situation is provided to the subject when they try and retrieve the information again later. It is important that the manipulation is within subject because the question is whether the same person can retrieve different information when provided with a different usage situation. If the retrieval set is constructed at retrieval, then the brands recalled should be appropriate to the usage situation at retrieval regardless of the usage situation provided at encoding. An efficient design for testing the research questions here includes two between subject manipulations and a repeated measure (the within subject test).

**Design**

The study is a $2 \times 2 \times 2$ mixed design with one repeated measure. The between subject factors are: two levels of knowledge (high, low), two levels of usage situation at encoding (usage situation, no usage situation). The repeated measure is two measures of recall (session one, session two).

All subjects are designated as either high or low in product knowledge. Subjects are randomly assigned to either the *usage situation* encoding condition or *no usage situation* encoding condition. See Table One. After the initial recall session, all subjects are given a second usage situation and asked to recall the brands again. The usage situations are counterbalanced. See Table Two.

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**Table One**

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**Table Two**
Encoding Conditions. Before reading the brand information, subjects are either provided with a usage situation or they are not (usage situation, no usage situation). This is a between subject factor included to test hypothesis one. Subjects assigned to the usage situation encoding condition use that usage situation to recall the brands in the first recall session. Subjects in the no usage situation encoding condition are provided a usage situation during recall session one. Consequently, all subjects have the same usage situation at retrieval. The difference between the two conditions is whether that same usage situation is presented only at encoding, or both at encoding and at retrieval. Subjects recall the information twice. They are provided with a different usage situation for each recall session, the order of presentation of the two usage situations (to be described in subsequent sections) is counterbalanced.

Knowledge Level. Each subject completes a knowledge questionnaire to measure their level of product knowledge. The sample is divided into high and low knowledge consumers with a median split on the knowledge questionnaire score.

Subjects. Sixty undergraduate students at a large Canadian university received course credit for participating in the study.
Stimulus Design

Product Category. The product category must be complex enough to allow for significant variation in the level of product knowledge and be relevant to university students. The product category of bicycles meets these criteria.

Brand Information. A 443 word story (see Stimulus One in Appendix F) describing a walk through a bicycle shop was used to present the brand information to subjects. The story was designed to realistically present information about brands, therefore improving the external validity of the study. The story contains information about ten different bicycles. The brand information includes five bicycles appropriate for one of the two usage situations described below, and five bicycles appropriate for the other usage situation. Each bicycle is described with a number of attributes. Some of the bicycles are described in more detail than the others. It would be extremely rare for a consumer to notice exactly the same number of attributes about each brand while shopping; the bicycles therefore, vary in the number of attributes used in their description.

The decisions made in the interest of external validity do not compromise internal validity. In the context of this study, it is important that the set of bikes appropriate for one usage situation is as memorable as the set of bikes appropriate for another usage situation. In the interest of providing equivalent information for each usage situation, the total number of attributes used to describe the bikes appropriate for each usage situation is similar (23, 24). Also the total number of words used to describe the bikes appropriate for each usage situation is similar (162, 160). Including the same number
of bicycles and the same amount of information for each of the usage situations is important because the hypotheses will be tested by comparing the number of usage situation appropriate brands recalled. An analysis of the between subject factors in a repeated measure ANOVA of bikes recalled with knowledge level and bike set (functional or trendy) was run to check that the two sets of five bikes were equally memorable. The analysis for between subject factors in the first recall session revealed that knowledge was a significant factor (as will be discussed in the results section), but the bike set factor and the interaction of knowledge level and bike set were not significant ((F(1, 116) = .07, p > .10) and (F(1, 116) = .47, p > .10), respectively).

Subjects are equally able to recall bikes appropriate to one set or the other, although the individual bike descriptions vary in length.

The designation of a brand as appropriate or relevant to a usage situation was made by a group of undergraduate students. Twenty students from the University of Toronto participated in this pretest. Each student read the story and then rated the importance of each attribute to one of the usage situations. Each attribute was rated on a five point scale anchored with not at all important and very important. The mean of the attribute ratings for each bicycle was used to assess whether the description of the bicycle was appropriate to one, the other or both of the usage situations. None of the bicycles were rated as appropriate for both usage situations.

Using technical terms would put the LKC at a disadvantage because they may not know the meanings of the terms, and therefore would not 'see' the appropriateness of a bicycle to a usage situation. To avoid this situation, care was taken to make sure...
the LKC would be able to understand the description of each bicycle. No brand names were used in the story. Instead, bicycles were described by their location in the store. For instance, the description states:

"The mountain bikes were set up to your left ..."

"You notice that tucked in the corner is a row of used bikes ..."

"Over to your right the racing bikes ..."

"There are two hybrid bicycles on display... ".

Using the location in the store instead of a brand name as the identifier for a brand allows the subject to concentrate on: 1] encoding new information for which previous knowledge is not yet stored in memory, and 2] the attributes and their appropriateness to a usage situation.

Usage Situations. For one of the usage situations, subjects were asked to "Imagine that you have decided that you will no longer drive or take the TTC to school. You are going to ride a bicycle. You need something to get you from point A to point B. You don't need anything fancy, just something durable and reliable. You are also concerned for your safety on the street." For the other usage situation subjects were asked to "Imagine that you have recently joined a bicycle riding club. The club meets on weekend afternoons for rides. You have only been to one meeting, but you like the people in the club very much. You notice however, that they all have trendy and stylish bicycles, and that you do not." Two usage situations suggest two sets of benefits sought: a functional, durable bicycle and a trendy, stylish bicycle.
The usage situations are similar in length, but may be different in their affect on guiding encoding or facilitating the search through memory for brands. If the usage situations were different in this way, then subjects would recall more of the brands when given one or the other of the usage situations. Half of the subjects were provided with the functional bike usage situation and the other half were provided with the trendy bike usage situation for the first recall session. If one of the usage situations was better in guiding encoding or retrieval, then the there should be a different number of brands recalled in session one depending on whether the subject used the trendy situation or the functional situation. Whether subjects used the functional or the trendy bike usage situation first was included as a factor, called usage situation, with knowledge level in a two way ANOVA on the number of bikes recalled in recall session one. The results reveal that, as expected, knowledge level is a significant factor (to be discussed in the results section), but that usage situation and the interaction of the two are not significant factors ((F(1, 56) = .07, p > .10) and (F(1, 56) = .7, p > .10), respectively). Although the usage situations are designed to be different, the results indicate that these differences do not affect the subjects' overall ability to recall brands.

**Measures**

**Knowledge Level Measures.** Many different measures have been used to assess the knowledge level of consumers. Examples of these different measures include: self-assessment estimates of the amount of their knowledge (Bettman and Park 1980; Johnson and Russo 1981; 1984; Srull 1983), score on a multiple choice knowledge test (Bettman and Sujan 1987; Sujan 1985), gender (Alba and
Knowledge Levels and Brand Retrieval

Chattopadhyay (1985), or combined self-assessed estimates of knowledge with more objective measures such as multiple choice, terminology and brand naming tasks (Brucks 1985; Mitchell and Dacin 1996). The knowledge assessment for this study includes both subjective and objective knowledge measures. These two types of knowledge have been reported as conceptually and operationally distinct (Brucks 1985), however, they are highly correlated here (see Correlation Matrix One in the Appendix E). The two measures are used to capture the two components of consumer knowledge: product familiarity and product expertise (Alba and Hutchinson 1987).

**Objective Measures.** The objective knowledge measure includes multiple choice questions, terminology questions and brand name listing. The multiple choice questions ask the subject how certain attributes affect the performance of a bicycle. For instance, the subject is provided with four types of material used in bicycle frames and asked to choose the material that would result in the fastest bicycle. The terminology questions ask for the definition of bicycle terms. For instance, the subject is asked to define the 'rear triangle', a term used to describe the part of the frame that connects the rear tire to the head tube (the tube between the seat and the pedals). The brand name listing question asks subjects to list as many actual brand names as they can. No actual brand names are used in the story.

**Subjective Measures.** The subjective knowledge measure includes self assessed ratings of familiarity, product usage and product knowledge. The subjects are asked to rate themselves on a ten point scale anchored with 'expert' and 'novice' for the product knowledge and familiarity measures, and a ten point scale anchored with 'very
frequently' and 'not at all frequently' for the product usage measure. See Measure One in Appendix D for full text of questionnaire.

A median split on the sum of the objective and subjective measures results in 31 high knowledge and 29 low knowledge consumers (the scores for two of the subjects lay on the median). The coefficient alpha for the measure was .86 indicating a high degree of internal consistency. All of the correlations between the individual objective and subjective measures are significant at $p < .0001$ (see Correlation Matrix One in the Appendix E).

**Dependent Measures.** The hypotheses to be tested with this study investigate whether the retrieval set is constructed at encoding or at retrieval. In the Objectives and Introduction section, it is stated that these hypotheses will be tested by measuring whether the brands recalled are important (or relevant) to the usage situation at encoding or at retrieval. Brand recall is measured with the total number of brands recalled, set composition and set variation. (The coding of the brands recalled is discussed in the next section.) The set composition variables are designed to investigate whether the brands recalled are relevant to the usage situation at encoding or at retrieval. Not only will the absolute number of relevant brands recalled be considered, but also how many usage situation relevant brands are recalled compared to the number of usage situation irrelevant brands recalled. This is particularly important if the total number of brands recalled varies between group, as it is expected to do here. The set variation variables are designed to investigate whether subjects recalled different brands when the usage situation changes at retrieval.
The specification of the variables is as follows:

*Brand Recall:*

1) *retrieval set size* - the number of brands recalled in a recall session,

*Retrieval Set Composition:*

2) *usage situation relevant brands* - the number of brands recalled that are designated as relevant to the usage situation,

3) *usage situation irrelevant brands* - the number of brands recalled that are not designated as relevant to the usage situation,

4) *the ratio* of usage situation relevant to usage situation irrelevant brands,

*Set Variation:*

5) *recovered brands* - the number of brands recalled in the second recall session that were not recalled in the first recall session,

6) *brands lost* - the number of brands that were not recalled in the second recall session that were recalled in the first recall session.

7) *adjustment (to the set)* - the sum of the number of recovered brands relevant to the second usage situation (relevant recovered brands), the number of brands irrelevant to the first usage situation, but retained in the second recall session (relevant retained brands), and the number of brands that were not recalled or relevant to the second recall session, but were recalled in the first recall session (irrelevant brands lost).

The following example should clarify the specification of the dependent measures, and how they relate to the hypotheses. If a subject recalled bikes 1, 2, 4, 7,
and 9 when provided with the functional usage situation, then the retrieval set size would be 5 brands: 3 usage situation relevant brands (1, 2, 9) because they are appropriate when a functional bike is required and 2 usage situation irrelevant brands (4, 7) because they are appropriate when a trendy, fashionable bike is required. The ratio of usage situation relevant brands to usage situation irrelevant brands would be 3/2 or 1.5. If the same subject recalled bikes 1, 3, 4, 7, and 9 when provided with the trendy usage situation then the retrieval set size would be 5 brands: 3 usage situation relevant brands (3, 4, 7) because they are appropriate when a trendy, fashionable bike is required, and 2 usage situation irrelevant brands (1, 9) because they are appropriate when a functional bike is required. The ratio of usage situation relevant brands to usage situation irrelevant brands would be 3/2 or 1.5. The subject recovered a relevant brand, bike 3, retained two relevant brands, bikes 4 and 7, and lost an irrelevant brand, bike 2. The adjustment to the set would be: 1 relevant recovered brand + 2 relevant retained brands + 1 irrelevant lost brand = 4 brands.

Coding. Subjects were asked to list as many of the bicycles as they could remember in the story. See Instruction Two in the Appendix G for the full text of the instructions. A bicycle was determined to be recalled if the subject mentioned details that were unique to that bicycle based on the original description. This determination was quite straightforward. As a check, an independent judge, blind to the hypotheses, examined 50% of the brand recall statements to determine whether they provided a unique description. The judge was instructed to code a bike as recalled if the subject used at least one attribute from the story to describe the bike. The attribute had to be
more specific than just the type (racing, mountain, used or hybrid). There were some errors made in recalling the bikes. For instance, on five occasions a subject created a super bike by combining attributes from two or more of the bikes in the story. In this case, the attributes mentioned first were used to identify which bike was recalled. Agreement was found on 96% of the brands recalled.
6 PROCEDURE

Subjects were randomly assigned to one of the two encoding conditions: *usage situation* or *no usage situation*.

At Encoding

Subjects in the *usage situation* encoding condition read the brand information after the presentation of a usage situation\(^1\). Subjects in the *no usage situation* encoding condition read the brand information without a usage situation. All subjects were asked to read the brand information slowly and carefully (see Instruction One in Appendix G for full text of the instructions). A fifteen minute filler task followed encoding. During this time subjects read part of an unrelated commentary discussing the creation of comic strips. No mention of bicycles or shopping is made in the material.

At Retrieval

Recall Session One. The instructions were as follows:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Session One Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the <em>no usage situation at encoding</em> condition</td>
<td>... the recall instruction includes the presentation of the first usage situation.</td>
</tr>
<tr>
<td>In the <em>usage situation at encoding</em> condition</td>
<td>... the recall instruction asks the subject to remember the first usage situation.</td>
</tr>
</tbody>
</table>

The rest of the instructions do not vary between conditions (see Instruction One in Appendix G for full text of the instructions). All subjects were asked to write the

\(^1\) The order of presentation of the usage situation is randomly assigned, some subjects see the trendy situation first and others see the functional situation first.
usage situation at the top of the page and recall as many of the bicycles from the original story as possible. A five minute filler task followed. During this time the subjects read more of the commentary they were reading earlier.

Recall Session Two. The instructions to all subjects at recall session two included the presentation of the second usage situation. All subjects were asked to write the usage situation at the top of the page and recall as many of the bicycles included in the original story as possible.

The knowledge measure questionnaire and debriefing followed.
7 RESULTS AND ANALYSIS

To ascertain whether the retrieval set is constructed at encoding or at retrieval, it is necessary to consider the composition of the sets of recalled brands. If the set is constructed at encoding then the brands recalled will be relevant to the usage situation present at encoding. Conversely, if the set is constructed at retrieval, the brands recalled will be relevant to the usage situation at retrieval, and should vary if the usage situation changes. The hypotheses assert that: 1] LKCs will be more likely than HKCs to recall brands that are relevant to the usage situation present during encoding because they construct the retrieval set at that time (hypothesis one), and 2] HKCs will be more likely than LKCs to recall brands that are relevant to the usage situation present during retrieval because they construct the retrieval set at that time (hypothesis two). The dependent variable used to examine the composition of the retrieval set is the ratio of usage situation relevant to usage situation irrelevant brands. Before testing the hypotheses it is useful to consider the total number of brands recalled because: 1] the variable used in the hypothesis testing is a ratio, and 2] it allows for a comparison of overall brand recall performance to that reported in past research.

A repeated measure ANOVA of the number of brands recalled with knowledge level, encoding condition, and recall session as factors (see Result One in the Appendix C) reveals a significant main effect for knowledge level \((F(1, 116) = 26.46, p < .0001)\) and recall session \((F(1, 116) = 14.41, p < .001)\). The analysis also reveals a significant two way interaction between knowledge level and recall session \((F(1, 116) = 21.76, p < \)
Knowledge Levels and Brand Retrieval

As expected, HKCs recalled significantly more of the studied brands than LKCs, as has consistently been found in previous research (Cowley 1994; Hutchinson 1983; Voss, Vesonder and Spilich 1980). See Table Three for the mean number of brands recalled. The results indicate that HKCs recall more than LKCs. LKCs are more likely to recall fewer brands in the second recall session than are HKCs. The three way interaction is due to an interaction between knowledge level and encoding condition in the first recall session (F(1, 116) = 5.28, p < .05), but not in the second recall session (F(1, 116) = 0.20, p > .10). In the first recall session, LKCs recall significantly more brands in the usage situation encoding condition (p < .05) than in the no usage situation encoding condition. It appears that the provision of usage situation at encoding encourages LKCs to organize information into a structure that later facilitates recall. HKCs recall approximately the same number of brands regardless of the encoding condition or the recall session. See Table Three for cell means.

Hypothesis One asserts that LKCs construct retrieval sets at encoding and, therefore, will be more likely than HKCs to recall brands that are relevant to the usage situation present during encoding. Hypothesis two asserts that HKCs construct retrieval sets at retrieval and, therefore, will be more likely than LKCs to recall brands that are
relevant to the usage situation present during retrieval. The hypotheses are tested with a repeated measure ANOVA on the ratio of relevant brands to irrelevant brands.

The repeated measure ANOVA includes knowledge level and encoding condition as factors. If the ratio for LKCs is greater than one in the usage situation encoding condition, and is one in the no usage situation encoding condition in the first recall session, and if the ratio is less than one in the second recall session in both conditions, then the results indicate that the retrieval set is constructed at encoding for LKCs. If these results are more likely for LKCs than for HKCs, then support will be claimed for hypothesis one. This will be indicated by a three way interaction of knowledge level, encoding condition and recall session, and a significant interaction of knowledge level and encoding condition in the first, but not second, recall session. If the ratio for HKCs is greater than one in both recall sessions, then the results indicate that the retrieval set is constructed at retrieval. If the results are more likely for HKCs than for LKCs, support will be claimed for hypothesis two. This will be indicated by a main effect for knowledge, a three way interaction between knowledge level, encoding condition and recall session, and an insignificant interaction between knowledge level and recall session.

Hypothesis One. The results of the repeated measure ANOVA of the ratio of relevant to irrelevant brands reveal one significant main effect, knowledge level (F(1, 116) = 30.77, p < .0001). The analysis also reveals an interaction of knowledge level, encoding condition and recall session (F(1, 116) = 5.41, p < .05). See Result Two in Appendix C for the full ANOVA table.
The results indicate that the ratio of relevant brands is higher for HKCs than for LKCs. HKCs recall 1.6 times as many relevant brands which is significantly different than zero (t = -3.57, p < .005), while LKCs recall only 1.1 times as many relevant brands which is not significantly different than zero (t = -1.09, p > .10). The interaction indicates that the ratio of relevant brands varies with the encoding condition in one of the recall sessions for LKCs. There is a significant interaction of knowledge level and encoding condition (F(1, 116) = 6.17, p < .05) in the first recall session, but not in the second session.

In all conditions the ratio is significantly greater than one for HKCs, indicating that they always retrieve a greater proportion of relevant brands. For LKCs, this ratio is significantly greater than one only for recall session one when they were given a usage situation at encoding. See Table Four for the ratio of relevant to irrelevant brands, and Table Five for the mean number of relevant to irrelevant brands recalled.

This result is important for two reasons. First, it supports hypothesis one, LKCs are able to recall more usage situation relevant brands when they are provided a usage situation at encoding. It is the usage situation at encoding therefore, that is used in the
construction of the retrieval set. Second, it demonstrates that LKCs are able to
distinguish between relevant and irrelevant brands and that they are able to recall more
relevant brands under certain conditions. LKCs recall an equivalent number of relevant
and irrelevant brands when the usage situation is not provided at encoding.

**Hypothesis Two.** In addition to the significant three way interaction and the
main effect for knowledge level, the analysis reveals that recall session does not
interact with knowledge level ($F(1, 116) = .97, p > .10$). Cohen's power statistic for this
null effect is .89 when alpha is .05. In other words, the ratio of usage situation relevant
brands does not change between recall sessions. HKCs are as able to recall brands
relevant to the usage situation in recall session one as they are in recall session two,
even though the usage situation has changed.

Hypothesis two will be further investigated by considering the *set variation*
variables. A variable labelled *adjustment* captures the variation in set composition
between the two recall sessions. Importantly, the adjustment variable measures
whether the variation in the retrieval set is appropriate given the new usage situation, or
whether the variation is random. Adjustment is:

- the sum $i$ of the number of recovered brands relevant to the second
  usage situation (relevant recovered brands),
- $ii$ the number of brands irrelevant to the first usage situation, but retained in the second recall
  session (relevant retained brands), and
- $iii$ the number of brands that were not recalled or relevant to the second recall session, but were recalled in
  the first recall session (irrelevant brands lost).
As the adjustment variable increases, it indicates that the new retrieval set is adjusted to be more relevant to the new usage situation. If the adjustment variable is zero, it indicates that the variation is negligible, or random. If the adjustment variable is significantly less than zero, it indicates that the retrieval set is becoming less relevant to the usage situation. This last situation may indicate that the usage situation is actually inhibiting the consumer from recalling relevant brands.

A two way ANOVA of the adjustment variable reveals a significant effect for knowledge level \( (F(1, 56) = 22.63, p < .0001) \) and a non-significant effect for encoding condition \( (F(1, 56) = 1.16, p > .10) \) and the interaction of knowledge level and encoding condition \( (F(1, 56) = 0.07, p > .10) \). HKCs adjust their retrieval sets in a manner described by i, ii, and iii above, more than LKCs. The adjustment occurs regardless of the encoding condition. See Table Six for the cell means.

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**Table Six about here**

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A closer look at each of the components of the adjustment variable is necessary to understand if the adjustment is due primarily to the increase of relevant brands, or to the loss of irrelevant brands.

**Recovered Brands.** A two way ANOVA of the number of recovered brands reveals that knowledge level is a significant factor \( (F(1, 56) = 34.83, p < .0001) \), but that encoding condition \( (F(1, 56) = 0.04, p > .10) \) and the interaction of knowledge level and encoding condition \( (F(1, 56) = 0.09, p > .10) \) are not significant. HKCs were able to
recall 1.34 brands in recall session two that were not recalled in session one. In both conditions, the mean number of brands recovered by HKCs was significantly greater than zero (in the usage situation condition, \(t = 5.98, p < .0001\), and in the no usage situation condition, \(t = 4.64, p < .0005\)). LKCs only recalled .14 brands in session two that they had not recalled in session one. In fact, the number of relevant brands recovered by LKCs is not significantly different than zero in either encoding condition (in the usage situation condition, \(t = 1.00, p > .10\), and in the no usage situation condition, \(t = 1.56, p > .10\)). See Table Seven.

Importantly, most of the brands are relevant to the second usage situation. When only the relevant recovered brands are included in the ANOVA, the knowledge factor is significant (\(F(1,56) = 42.34, p < .0001\)). HKCs recovered an average of 1.15 relevant brands, which is significantly different than zero (\(t = 7.98, p < .0001\)). LKCs, on the other hand, recovered an average of .07 relevant brands, which is not significantly different than zero (\(t = 1.44, p > .10\)).

**Brands Retained and Lost.** In session two, HKCs did not recall 1.23 brands of those they had recalled in session one, and 79% were brands irrelevant to the second usage situation (see Table Eight). In both encoding conditions, the number of relevant brands lost by HKCs was not significantly different than zero (in the usage situation at encoding condition, \(t = 1.38, p > .10\), and in the no usage situation at encoding
condition, \( t = 1.29, p > .10 \). Conversely, in both encoding conditions, the number of irrelevant brands lost by HKCs was significant (in the usage situation at encoding condition, \( t = 5.89, p < .0001 \), and in the no usage situation at encoding condition, \( t = 4.00, p < .001 \)). In session two, LKCs did not recall 1.29 brands of those they had recalled in session one, 56% were irrelevant to the second usage situation. In both encoding conditions, the number of relevant and irrelevant brands lost by LKCs were significantly different than zero (in the usage situation at encoding condition, relevant brands, \( t = 2.69, p < .05 \) and irrelevant brands, \( t = 2.71, p < .05 \), and in the no usage situation at encoding condition, relevant brands \( t = 2.40, p < .05 \), and irrelevant brands, \( t = 2.08, p > .10 \)). The loss of brands between sessions by the LKC is equally distributed across the relevant and irrelevant brands: this is not the case for HKCs who lost more irrelevant brands.

The set variation analysis further supports both hypotheses one and two by demonstrating that the retrieval situation is more influential in determining brand retrieval for HKCs than for LKCs. Evidence is observed by comparing across retrieval sessions. The HKCs retrieved usage situation relevant brands even after the usage situation changed at retrieval. LKCs did not systematically alter the composition of the retrieval set, but instead recalled brands important during encoding in the usage situation condition regardless of the usage situation at retrieval.
8 LIMITATIONS OF STUDY ONE

There are two limitations to the design which threaten the validity of the results of the study. First, the encoding manipulation (when the first usage situation was presented) was meant to be the only variation in the two conditions in recall session one. Any differences in brand recall or set composition could then be attributed to the manipulation. However, in the usage situation encoding condition, the subject must recall the usage situation during the first recall session. In the no usage situation encoding condition the subject is provided with a usage situation during the first recall session. If brand recall is different when the usage situation must also be recalled, then the encoding manipulation is confounded. The threat of the confound can be investigated by comparing the retrieval set composition in the usage situation encoding condition to a condition where the same usage situation is stated at encoding and at retrieval. It would also appropriate to compare whether the retrieval set is adjusted when a new usage situation is offered in recall session two.

Second, the retrieval manipulation (a change in usage situation) was meant to be the only variation between recall session one and recall session two. However, the original usage situation may inhibit the ability to recall new information (not recalled in session one) with the 'new' usage situation provided in session two. This threatens the validity of the retrieval manipulation. The threat could be investigated by comparing the composition of the set of retrieved brands in recall session one in the no usage situation encoding condition to a condition where no usage situation is offered at encoding or during the first recall session. Perhaps LKCs are unable to use the second usage
situation because the encoding and retrieval situations are different. In one case, there is no usage situation at encoding, but there is a usage situation at retrieval. In the other case, the usage situation changes between encoding and recall session two. In the condition suggested here, subjects will be allowed to both encode and retrieve the information in recall session one without the presence of a usage situation.

To investigate the effects these limitations have on the results of Study One, two control conditions are used to test whether: 1) the requirement of remembering the usage situation at recall affects the ability to recall brands, and 2) the provision of the first usage situation interferes with the use of the second usage situation.

**Design and Procedure for the Control Conditions.** The first control condition is designed to test for the effect of remembering the usage situation at recall. The *restate at retrieval* condition provides the subject with the same usage situation at both encoding and retrieval. The second control condition is designed to test for the possible interference caused by the first usage situation during recall session two. This condition requires that subjects recall the brands once without a usage situation at either encoding or in recall session one. The subject is given a usage situation only at recall session two. This condition, *no usage situation until recall session two* condition, will test whether subjects can recall new information relevant to the usage situation at retrieval when previous usage situations are not present to interfere with recall.
Knowledge Levels and Brand Retrieval

<table>
<thead>
<tr>
<th>Condition</th>
<th>Session One Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the <em>restate at retrieval</em> condition</td>
<td>... the recall instruction includes the second presentation of the first usage situation.</td>
</tr>
<tr>
<td>In the <em>no usage situation until recall session two</em> condition</td>
<td>... the recall instructions do not make reference to a usage situation.</td>
</tr>
</tbody>
</table>

Both the control conditions were run after the main study. Overall brand recall was equivalent between the control and main study conditions. See Table Nine for cell means. Comparisons will be drawn only to the condition they were designed to control.

Sixty undergraduate students from the University of Toronto were recruited to participate in the control conditions. Two of the sixty did not follow the instructions and were therefore, not included in the analysis. The same knowledge measure was used to divide subjects into high and low knowledge groups. A median split on the knowledge score resulted in 30 high knowledge subjects and 28 low knowledge subjects. The coefficient alpha was .91 indicating a high degree of internal consistency.

**Results.** In the *restate at retrieval* condition, subjects were presented with the same usage situation at encoding and at recall session one. If the results of the first study are explained by a difference in the ability to recall brands when the usage situation is remembered versus when it is stated at retrieval, then there should be a significant two way interaction of knowledge level and encoding condition, or a...
significant three way interaction of knowledge level, encoding condition and recall session, in the results of a repeated measure ANOVA of the ratio of relevant to irrelevant brands. These interactions would suggest that the differences in set composition found in the main study, might be attributable to the difficulty of recalling brands when the usage situation is stated at retrieval, not the encoding manipulation.

The results of the repeated measure ANOVA do not provide evidence indicating that the results of the first study are attributable to the remember versus restate difference in the restate at retrieval and the usage situation conditions. See Result Three in the Appendix C for the full ANOVA table and Table Ten for the ratios. The only significant effects in the results are the main effect of knowledge level \( F(1, 110) = 24.44, p < .0001 \), and the main effect of recall session \( F(1, 110) = 8.64, p < .01 \). Of the null effects, two are of interest here; the two way interaction between knowledge level and encoding condition is not significant \( F(1, 110) = 0.92, p > .10 \), and the three way interaction between knowledge level, encoding condition and recall session is also not significant \( F(1, 110) = 1.85, p > .10 \). The power statistics when alpha is .05, for these two interactions are .85 and .89, respectively.

The ratio of relevant brands is higher for HKCs in both sessions, and is higher in the first recall session for all consumers. It appears that the restatement of the usage situation does not increase the similarity of the encoding and the retrieval setting.
because the effects of encoding specificity are not observed here for high or low knowledge consumers. According to the principles of encoding specificity, the more similar the encoding and the retrieval situation, the greater the ability to retrieve information (Tulving 1983; Tulving and Thomson 1973). In a repeated measure ANOVA of brands recalled, there is no effect for encoding condition ($F(1, 110) = 0.89, p > .10$). See Table Nine for the mean number of brands recalled.

In the no usage situation until recall session two condition subjects were not presented with a usage situation until recall session two. An alternative explanation for the results of the retrieval manipulation in the main study is that the usage situation used in recall session one interfered with the use of the usage situation in the second recall session. The hypothesis will be rejected if the results of a repeated measure ANOVA of the ratio of relevant brands in the no usage situation and the no usage situation until recall session two encoding conditions, reveal a significant three way interaction between knowledge level, encoding condition and recall session. This interaction would be significant if HKCs were able to recall more relevant brands, except when the usage situation is no present at encoding or retrieval (session one in the no usage situation until session two encoding condition), and if LKCs do not tend to recall relevant brands.

The results of the ANOVA reveal a significant effect for knowledge level ($F(1, 118) = 38.20, p < .0001$), the interaction between knowledge level and recall session ($F(1, 118) = 4.58, p < .05$), and the three way interaction between knowledge level, encoding condition and recall session ($F(1, 118) = 11.58, p < .001$). See Result Four in
Appendix C for the full ANOVA table. Again, HKCs recall more relevant compared to irrelevant brands, particularly in the second recall session. Therefore, the hypothesis can be rejected.

As Table Ten indicates, there are no significant differences in the ratios within knowledge level, between experimental and control conditions for HKCs. ANOVAs of the ratio of relevant to irrelevant brands recalled by HKCs, including main and control conditions, reveals that the encoding condition is not significant for session one ($F(1, 55) = 1.26, p > .10$) or session two ($F(1, 55) = 1.76, p > .10$) with power statistics of $.89$ when alpha = .05. ANOVAs of the ratio of relevant to irrelevant brands recalled by LKCs, including main and control conditions, reveals that the encoding condition is not significant in session one ($F(1, 55) = 2.06, p > .10$) or session two ($F(1, 55) = 0.246, p > .10$), but the power statistic are only $.44$ when alpha = .05.
9 IMPLICATIONS AND DISCUSSION

Using the information at encoding to construct a set of brands for retrieval later is the encoding explanation of brand retrieval. LKCs use the usage situation at encoding to determine what brands will be recalled. The set includes the brands designated as important to the learning situation. LKCs retrieve this set each time they need to recall brands regardless of the usage situation at retrieval. This evidence supports the assertion that brand retrieval for LKCs is described with the encoding explanation.

Using the information present during retrieval to construct a set of brands by searching through memory is the retrieval explanation of brand retrieval. Retrieving different brands for each choice occasion is consistent with the retrieval explanation. HKCs recall different brands when as the usage situation at retrieval varies. The brands retrieved are appropriate for the new usage situation. This evidence supports the assertion that brand retrieval for HKCs is described with the retrieval explanation.

It has been demonstrated elsewhere that the set remembered at choice provides a context that influences the decision (Nedungadi 1990). If LKCs always recall the same set of brands and do not appear to acknowledge the situation at retrieval, then choices should be relatively stable over time. If HKCs recall different brands, then choice should vary more over time. Importantly, the set retrieved at choice should be composed of more appropriate brands, therefore improving the overall quality of the decision.
CHAPTER THREE
Low Knowledge Consumers:
List Structures and Presentation Order

1 INTRODUCTION

In Chapter One LKCs, were hypothesized to encode brand information as a list of brands accumulated during a learning episode. The brands are simply linked to the learning episode without any integration over brands or attributes. For example, if a brand is mentioned with one attribute and later with another, two links will be created from the learning episode to a brand with the first attribute and a brand with the second attribute. The two statements are treated independently. If integration over the brand had occurred, then two links would have been created connecting the two attributes to the brand. When retrieving brands, a LKC merely accesses the learning episode and recalls the brands most strongly associated with, or relevant to, the learning context. The results of Study One are consistent with this hypothesis. LKCs recalled brands relevant to the usage situation at encoding regardless of their relevance to the usage situation at retrieval.

There are two critical issues, however, that limit the assertions that can be made on the basis of the results of Study One. First, the assumption that LKCs do not integrate brand information at encoding is based on the finding that LKCs did not recall brands relevant to the usage situation at retrieval, and were not likely to change the set of brands recalled as the usage situation at retrieval changed. Although the null effects reported in Study One are consistent with the hypothesis, they do not provide strong
supporting evidence. Null results allow for alternative explanations, such as encoding specificity. It is possible, although unlikely based on the results of the control conditions in Study One, that the presence of a usage situation at encoding interfered with the LKC's ability to recall different brands: a test that indicates integration during encoding.

Second, the assertion that LKCs associate the brand to the learning episode instead of integrating over brands, attributes, and usage situations, is tenuous because there is only one learning episode in the first study. There must be more than one episode during the learning session to demonstrate that some consumers, in this case LKCs, associate new information to the learning episode and others do not.

The discussion and empirical study included in this chapter address these two limitations. The discussion reviews research results investigating memory performance when the encoding situation is interpreted here as either: 1] limiting the opportunity to integrate information on a list, or 2] encouraging the opportunity to integrate information on a list. The empirical study is designed to test whether the level of consumer knowledge moderates the memory performance of consumers when presented with a list of brand-attribute pairs. Memory performance for high and low knowledge consumers will be compared to the results of past research studies where integration was either encouraged or discouraged.
2 RETRIEVAL WHEN THE LIST IS NOT INTEGRATED

How will brand retrieval be affected when information is not integrated at encoding? There is no study reported in the consumer behaviour literature that limits the opportunity to integrate brand information at study, and then tests for an effect on brand retrieval. There have been studies, however, in cognitive psychology in which the amount of integration is limited to using items that do not lend themselves to integration of the to-be-learned information (some examples are Craik 1970; Craik and Watkins 1973; Rundus, Loftus and Atkinson 1970; Rundus and Atkinson 1970). In these studies, subjects see a list of relatively meaningless information (such as numbers (Darley and Glass 1975), or unrelated words (Bruce and Papay 1970; Craik and Watkins 1973; Rundus, Loftus and Atkinson 1970; Sato 1990)) and after a brief study session, they try to recall items from the list. Typically, items presented at the beginning of the list and items presented at the end of the list were better recalled than the items presented in the middle of the list.

Presentation Order Effects

Primacy Effects. A primacy effect occurs when the probability of retrieving the first few items in a list is higher than the retrieval probability of other items on the list. Primacy effects are robust when the task at test is recall. The effects have been found both when subjects are aware of an impending memory test (Rundus, Loftus and Atkinson 1970), and when they are not (Craik and Watkins 1973). Many explanations exist for the effect, but two of the most commonly cited are:
1] the rehearsal explanation (Craik 1970; Rundus 1971; Rundus and Atkinson 1970). According to this explanation, individuals rehearse information presented on a list while it is held in working memory. The more often a piece of information is rehearsed, the greater the probability the information will be transferred to long term memory. As working memory reaches capacity, new information entering working memory supplants the incumbent information. Because the first pieces of information on the list are rehearsed longer, they have the highest probability of transfer to long term memory, and therefore, a greater probability of recall.

The rehearsal explanation is perhaps the most common explanation for the primacy effect, although many compelling studies question its explanatory power. Of these studies, some limit the opportunity to rehearse with time constraints (Kim and Oh 1979; Leshowitz and Hanzi 1974; Titus 1991; Wixted and McDowell 1989), instructions (Bruce and Papay 1970; Titus 1991) or distraction (Murdock 1965), but still find primacy effects.

2] the von Restorff effect (von Restorff 1933). According to this explanation, distinct items are better recalled than other items. If the first items in the list are the most distinct then they should be recalled with a higher probability than subsequent items. Titus and Robinson (1973) offer support of this explanation when a shift in the voice in auditory list presentation resulted in a primacy effect whenever the shift occurred. Shiffrin (1970) suggested that primacy effects are the result of both rehearsal and the von Restorff effect, however, Rundus (1971) presents evidence that the von
Restorff effect is due entirely to an increase in the amount of rehearsal for distinctive items (Rundus 1971, Experiment 2).

Craik incorporated the same principle into his distinctiveness hypothesis (Craik 1979). In this explanation, the initial items are distinct because a necessary condition of being non-distinct is the knowledge of other items. With the introduction of each new item, there is a reduction in the distinctiveness of the item. The diminishing distinctiveness causes a reduction in the depth of processing because more distinct items are assumed to be processed more deeply than non-distinct items. A reduction in the depth of processing ultimately lowers the probability of recall (Craik and Lockhart 1972).

All of these explanations rely on the assumption that the individual processing the information is simply trying to encode the information without any attempt to learn, integrate or group the items on the list. The implication is that there is a relationship between the absence of integration and the primacy effect. Tulving and Madigan (1970) suggest in their review of memory and verbal learning, that presentation order effects are related to instances where 'the barest minimum by way of learning' occurs (page 454). If the same logic is applied to consumer learning, consumers that process brand information in a non-integrative manner are more likely to demonstrate primacy effects in recall than are consumers that integrate and interrelate a brand-attribute statement to other brands and attributes present during the same learning episode.

Recency Effects. The standard explanations for recency effects (the tendency to recall the last few items presented) are; 1] more rehearsal time occurs for the last
items on the list because new items do not supplant them in working memory (Rundus 1971; Rundus and Atkinson 1970), and 2) the presence of the last few items in working memory make retrieval of these items less effortful and therefore more likely (Atkinson and Shiffrin 1968; Crowder 1982; Glanzer 1972). A delay in retrieval, or the occurrence of a distraction between processing and retrieval will result in the clearing of working memory and the disappearance of recency effects in item recall (Craik and Watkins 1973). The observation of recency effects in recall has been less reliable than the observation of primacy effects (Murdock 1995).
3 RETRIEVAL WHEN THE LIST IS INTEGRATED

Primacy effects are expected to attenuate or even disappear under certain circumstances such as: 1) when all of the items on a list are presented at the same time, 2) when the first few items are used to structure and group the remaining items on the list, or 3) when relations between items can be detected.

First, when all of the items on a list are presented at the same time, there is more opportunity for integration because: 1) no cognitive resources are expended on maintenance rehearsal to remember the items during integration, which frees cognitive resources for elaborative rehearsal (Craik and Lockhart 1972), and 2) the relations between items may be more obvious (Bettman, Johnson and Payne 1991). Evidence in both person perception (Takahashi 1977) and consumer behaviour studies (Kardes and Kalyaram 1992) demonstrate that presenting items simultaneously attenuates the probability of primacy effects in recall.

Second, the first few items on a list may be used to try and organize the other items or provide structure to the other items in the list (Anderson and Bower 1972). In this case, the individual is using the first items as a basis for assessing similarities and differences between the list items. This type of processing is integrative because the individual organizes the list on the basis of some principle taken from the first few items, instead of simply learning each item individually.

Finally, when an individual can detect or 'see' relations between items, those relations are used to structure the information on the list. Rundus (1971) presented both related and unrelated words to subjects and found that recall was better for related
words (experiment 4). Importantly, during encoding subjects associated the related words to other words in the category “instead of simply including the new item in some ongoing rehearsal pattern” (page 74).

If the opportunity for integrating the information improves, then the probability of observing primacy effects during recall decreases. Logically then, consumers that do not demonstrate primacy effects in recall are integrating the new information. Since an intervening task is used after exposure to the brand information, recency effects are not expected.
4 HYPOTHESES

H3: Presentation order will be more likely to affect brand retrieval probabilities for LKC than for HKC. More specifically, primacy effects will be more likely to be observed in brand recall for LKC, than for HKC.

H3a: Primacy effects will be observed within each learning episode for LKC.
5 THE EMPIRICAL OBJECTIVES

Past results demonstrate that presentation order is a significant factor in recall. The effects are most pronounced when the information presented does not encourage integration, and are attenuated when the information does not encourage integration. It follows then, that if the presentation order is a significant determinant in brand retrieval, then the individual is not processing integratively. The hypotheses assert that the LKC will not integrate the information at study, but instead will treat the items as pieces of unrelated material learned as instances of a learning episode. A symptom of the lack of integration will be primacy effects in brand recall.

In this study, subjects see two lists of brand attribute statements. The brands can be integrated over usage situation because three brands are associated to each usage situation. After a brief study session and a filler task, subjects try to recall as many of the brands as possible. Primacy effects will occur in the recall performance of consumers (subjects) that do not integrate the information. Order effects, specifically primacy effects, will not be observed if the consumer is associating the items or integrating the information. The objective of Study Two is to investigate the influence of presentation order on the probability of recall.
6 DESIGN

Study Design

Subjects see brand information on two lists of brand-attribute statements (first, second). Unlike Study One, there are no usage situations, or other cues to structure the information during encoding. After a brief study session, and filler task, subjects try to recall as many of the brand names as possible.

The design includes 2 levels of consumer knowledge as a measured between subject factor. Subjects are randomly assigned to one of two versions of the lists which counterbalance the order of presentation of the brand names. The measure of recall performance is the probability of recalling brands from three positions on the list (the beginning, middle or end).

Subjects. Twenty-eight undergraduate subjects received course credit for participation in the study. Two subjects did not properly complete the study questions and were not included in the analysis.

Stimulus Design

The Product Category. The product category must be complex enough to allow for significant variation in the level of product knowledge and be relevant to university students. The product category of cameras meets these criteria.

The Brands. The brand names used here are hypothetical in order to avoid any differences in memory accessibility or previous associations that might occur with
existing brand names. Existing brand names may be more familiar to higher knowledge subjects and therefore affect their ability to recall the brands.

The brand names are five letter nonsense words. The brand names were pretested to check for:

1) significant differences in the probability of recalling the different names,
2) associations between the brand names and existing camera brand names, and
3) associations between the brand names and any existing brand name.

Pretest One - Similarity to Existing Brand Names

Forty undergraduate students were shown each of twenty brand names with the following instructions:

i] list any characteristics associated with cameras that come to mind when you read each of the hypothetical brands,
ii] rate your familiarity with each of the hypothetical brand names,
iii] state whether the brand name reminds you of other existing brand names and,
iv] identify other similar and related brand names.

Two of the hypothetical names reminded subjects of existing camera brands. Three of the hypothetical brand names (including the two previous names) reminded subjects of brand names for other products. These brand names were not included in the main study. Many of the comments made during the pretest were speculations as to the country of manufacture or the language the word might be taken from. Although

\[2\] A pilot test using existing brand names resulted in similar effects for the presentation order as are reported here, except that there was an effect for the familiarity with the brand.
there was some consensus as to the country itself, there was no systematic consensus as to the meaning of the 'word' (no more than one subject identified a particular meaning for the word).

Pretest Two - *Memorability Pretest*

Twenty students were shown 16 brand names and asked to rate whether the camera sounded as though it might be 'easy to use' on a scale anchored with 'easy to use' and 'difficult to use'. Ten minutes later they were asked to recall as many of the brands as possible. The position on the list (beginning, middle or end) is counterbalanced between four lists. When *position on the list* is a covariate, there are no significant differences in the probability of recall between the brands.

**The Attributes.** The attributes are described using simple language. The description for less common attributes included the benefit associated to the attribute. For instance,

'Davon cameras have an automatic shutterlock which prevents accidental exposures'.

'Menze cameras have a solid, durable body which is good for travelling'.

**The Lists.** Two lists were constructed which contained ten statements each: six target, two filler and two buffer statements. All of the statements were approximately twelve words long. Each of the statements related to one of four usage situations: for beginner photographers, for professional shots, for travelling, and for someone that wants a trendy, stylish camera.
**Target Statements.** Each subject saw twelve target statements (6 statements x 2 lists). The target statements consisted of a hypothetical brand and an attribute. Two of the six statements were presented at the beginning of the list (statement two and three), two of the statements were presented in the middle of the list (statement five and six) and two at the end of the list (statement eight and nine).

Each brand and each attribute was mentioned once, in only one of the two lists. The lists were constructed such that:

1] brands associated to the same usage situation were not seen sequentially,
2] each brand was seen only once, and
3] each usage situation appeared on both lists.

There was an opportunity for integration over usage situations however, as three of the attributes related to each of four usage situations. See Stimulus Two in Appendix F.

**Filler and Buffer Statements.** Two of the statements were buffer statements (statements one and ten) and two were filler statements (statements four and seven). These statements were general statements about cameras or photography. For instance:

‘Photography has become a very popular hobby these days’

Generally, the results of studies investigating the influence of presentation order reveal a fairly smooth function declining from the relatively high probability of retrieval for the first few items. The filler statements served to segregate the lists such that the target items captured the beginning, middle and end of the serial position curve.
The order in which brands were presented was counterbalanced between the two sets of lists. Brands that were at the beginning of the list on the first version of the lists were either in the middle or at the end of the list on the second version of lists. An ANOVA reveals that the list version was not a significant factor in brand retrieval ($F(1,47) = 0.09, p > .10$).
7 PROCEDURE

Twenty eight undergraduate commerce students were run in small groups of four to eight. Subjects were randomly assigned to one of the two versions of the lists.

Subjects were informed that they would be participating in a number of short tasks. The first would be to read brand information about cameras. They were warned that the brands were hypothetical, and that they should not be concerned that the brand names were unfamiliar to them. The subjects saw the brand attribute statements projected on a screen, and heard the study administrator read the statements aloud. Each of the statements was seen individually. Subjects were encouraged to ask for more time to read the statements if the pacing of the presentation was too brief. No subjects complained of the pace. This presentation format was implemented to encourage the subject to pay attention to the information.

The remainder of the session is divided into three parts: two study sessions and one test session.

**Study Session One.** Subjects saw the first list of ten statements about cameras projected on a screen with an overhead projector, while the administrator read the statements aloud. Each statement was visible for approximately ten seconds. Each statement was seen sequentially. Following the study session, subjects read unrelated material for five minutes.

**Study Session Two.** Subjects saw the second list of ten statements about cameras projected on a screen with an overhead projector, while the administrator read
the statements aloud. Each of the statements was seen sequentially. A second five minutes was spent reading unrelated material.

**Test Session.** Subjects recalled as many of the brands as possible from the two lists. Following the free recall task, subjects completed a knowledge questionnaire, were debriefed and thanked for their participation.

**Measures**

**Dependent Measure.** Recall performance is measured as the probability of recalling a brand from the beginning, middle and end of the list.

**Independent Measures.** Both objective and subjective questions were used to measure expertise and familiarity with the product. The objective measures are designed to test for knowledge of existing brands and attributes. The subjective knowledge measures are designed to test for experience and familiarity with the product.

**Objective Measures.** Subjects were asked to define technical terms describing the process of taking photos, such as ‘depth of field’. Subjects were also asked to describe attributes associated to cameras such as ‘f-stop’. Finally, subjects were asked to list as many brand names for existing cameras as they could.

**Subjective Measures.** Subjects were asked to rate their familiarity, usage and knowledge on ten point scales. The anchors for these scales are not very familiar / very familiar, not very often / very often and novice / expert, respectively.

A median split on the knowledge measure results in 13 HKCs and 13 LKCs. The coefficient alpha for the measure of knowledge is .89. All of the correlations between
the individual objective and subjective measures are significant at \( p < .01 \) (see Correlation Matrix Two in Appendix E).
8 ANALYSIS AND RESULTS

Hypothesis three asserts that the presentation order of information at encoding influences the retrieval behaviour of LKCs more than HKCs. LKCs will demonstrate primacy effects in recall.

The hypothesis is tested with a mixed ANOVA on retrieval probabilities, with knowledge level, and the list (first, second) as between subject factors and list placement (beginning, middle, end) as a within subject factor. The results of the ANOVA reveal non-significant results for the between subject factors of knowledge level (F(1, 152) = 0.15, p > .10), list (F(1, 152) = 1.35, p > .10), and the interaction of the two (F(1, 152) = 0.00, p > .10). The probability of retrieval of brands was the same regardless of knowledge level or list. The results of the within subject analysis, however, reveal a significant effect for list placement (F(2, 302) = 7.57, p < .001\(^3\)), and the knowledge level and list placement interaction (F(2, 302) = 12.0, p < .0001). To facilitate the interpretation of this interaction, separate ANOVAs were run for each knowledge level. The ANOVA for LKCs reveals that the list factor is non-significant (F(1, 76) = 0.57, p > 0.10), and the list by list placement interaction is non-significant (F(1, 76) = 2.39, p > .10), but that list placement factor is significant (F(1, 76) = 19.23, p < .0001). The retrieval probabilities for LKCs for the items at the beginning of the list are significantly greater than the probabilities for items in the middle (t = -2.65, p < .01) or at the end of the list (t = -2.65, p < .01). Retrieval probabilities for HKCs are

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\(^3\) The significance levels have been adjusted with the Huynh-Feldt ε which is the appropriate ε for univariate tests on within subject factors used with small sample sizes. The significance levels when adjusted with the Greenhouse-Geisser ε are similar to those reported here.

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unchanged regardless of list placement ($F(1,76) = 0.34, p > .10$). See Table Eleven and Figure Three below for the results. Hypothesis 3a asserts that the primacy effect will be found in the recall of LKCs for each list. The results support this hypothesis as the list placement factor is measured for each list, and does not interact with the list factor.

It is interesting that the knowledge level factor was insignificant, indicating that low and high knowledge consumers are equally able to recall brands. Although the attributes were likely familiar to the HKC and therefore useful in integrating the brands, the brand names themselves were not familiar. With no indication that the brands will become meaningful in the future, the HKC may note the attribute, but pay little attention to the brand.

It was hypothesized in Chapter One that the LKC processes the information as a list seen in a particular learning episode, perhaps as 'things I saw in the lab today'. Hypothesis 3a asserts that primacy effects will be evident in the brand recall for LKCs within list. The data observed here suggests that instead of 'things I learned in the lab today', it is the list that is the learning episode, therefore the heading may be 'things I
learned on the first list' and 'things I learned on the second list'. The pattern of retrieval probabilities when considering the two lists individually (see Figure Four) is consistent with this assertion. The LKC shows primacy effects for each of the two lists. See Table Eleven.

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figure four about here

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9 DISCUSSION OF STUDY TWO

In Study One, the LKC used the usage situation at encoding to help guide encoding. In Study Two, there was no information at encoding to guide the process. It is inferred from the results that the LKC encodes the information as a list of unrelated pieces of information. This inference is based on the similarity in memory performance between the LKC and subjects in research studies where the opportunity to integrate the items presented in the lists was minimized. The study is simple, but important because LKCs may have used the usage situations at encoding to guide processing in Study One because they were relevant to the information to-be-learned. If LKCs use the information at encoding when it is relevant, perhaps they use other information at encoding, such as knowledge structures in memory, when the information is not relevant. If this were the case, then LKCs would have used these memory structures in Study Two to integrate the information in the lists and would not have shown primacy effects in recall.

Further, the LKCs also appear to consider each list as an independent learning episode. There are primacy effects within each list. This is noteworthy because it means that the learning episode is defined as a period of uninterrupted learning. It would be interesting to investigate whether LKCs confuse the brands within list more often than between list. The temporal co-occurrence may be the most important factor in confusions.

Murdock (1976) asserts that an instance in which order effects are not observed is easily argued as a situation in which the subject had the opportunity and ability to
associate the items to each other on the basis of their content. If the information about brands was integrated during encoding, then the retrieval probabilities would vary in a manner uncorrelated to presentation order. This is the pattern of results for the HKC. HKCs may be able to use knowledge structures from memory to organize the information and 'see' the relations between items. The HKC may be able to associate the information into a network of brands, attributes and benefits.
CHAPTER FOUR

The Role of Product Knowledge in Recognition Judgments

1 INTRODUCTION

The results of the first study revealed that HKCs not only recall more brands than LKCs, but more brands relevant to the usage situation at retrieval than LKCs. It is hypothesized that this occurs because HKCs integrate brand information during encoding by linking brands, attributes and usage situations. Although the results of Study One are consistent with this hypothesis in that HKCs were able to recall different brands when the usage situation at retrieval varied, the study was not designed to directly test whether a HKC integrates brand information at encoding.

It has often been reported that integrating information during encoding affects the amount of time required to later recognize the information (some examples are Anderson 1974; 1976; Anderson and Bower 1973; Hayes-Roth 1977; Lewis and Anderson 1976; Reder and Anderson 1980; Reder and Ross 1983; Whitlow, Smith and Medin 1982). Specifically, as the amount of information (attributes, for instance) linked to a concept (a brand, for instance) increases, the amount of time required to recognize any of the attributes also increases (i.e. the fan effect). If HKCs take longer to recognize information as the number of attributes linked to a brand increases, then it implies that they integrated the information at encoding.

It has been hypothesized that LKCs do not integrate information. The results from Study One and Study Two are consistent with this hypothesis. In this case, the
time required for LKCs to recognize information as the number of attributes linked to a brand increases should not be affected.

In the following sections, recall and recognition processes are compared, research examining how the organization of newly acquired information affects the time required to make recognition judgments and the errors that are likely to occur is reviewed, and research hypotheses based on this review are formulated. A description of the study designed to test them and the results of this study are then presented.
2 RECALL AND RECOGNITION

Retrieval processes in recall depend on the structure and organization of memory (Mandler 1980). In a discussion of recall, Mandler comes to the conclusion that recall improves when items are interrelated during encoding. Using the same logic in a consumer context, interrelating the brands, attributes and usage situations during encoding should facilitate recall. Retrieval processes in recognition, however, depend on the structure and organization of information in memory, as well as 'feelings of familiarity' (Mandler 1980).

The results of Studies One and Two suggest that LKCs process each item individually and are more likely to link the brands to the learning episode than to other brands, while HKCs integrate the information by interrelating the brands on the list. Since LKCs process information by concentrating on each item individually, their performance on recognition tests will be facilitated. Since HKCs process information by integrating items, their performance on recall tests will be facilitated. There may be situations, however, where interrelating items facilitates recognition. Recognition, which is discussed in detail in a subsequent section, is a process that may involve retrieval (Anderson and Bower 1972; Mandler 1980). Therefore, interrelating items will improve recognition to the extent that recognition judgments rely on retrieval.

Recall

Recall is necessary when the task is to provide events or instances that occurred in a specified context (Mandler 1980). The generate-recognize model of recall suggests that recall is a process of generating possible alternatives from memory, and
then identifying the information as occurring during a particular context (Kintsch 1970). The process of generating possible alternatives relies on the associations created between the instances, and the context provided for recall. Although both generative and discriminatory processes are necessary for accurate recall (Hunt and McDaniel 1993; Jacoby and Hollingshead 1990), the generative function is primary. High and low knowledge individuals vary in their ability to recall previously presented material because the generation of alternatives during recall is dependent on the organization of information in memory. A more organized structure for information in memory provides retrieval cues which facilitate the generation of alternatives (Tulving and Pearlstone 1966).

Recognition

The conventional wisdom of the late sixties attributed recognition performance entirely to the identification of feelings of familiarity for an event. It was assumed that recall required retrieval, and a decision on the match between the information and the context in question (see the generate-recognize model above), while recognition required only a decision based on familiarity (Kintsch 1967; 1968; Murdock 1968). The belief was that “organization facilitates retrieval, and (that) only recall involves retrieval” (Kintsch 1968, page 482). Therefore, the organization of information in memory should have no bearing on recognition.

This distinction between recognition and recall was questioned when a series of studies demonstrated a relation between the organization of information and recognition (Atkinson and Juola 1973; 1974; Juola, Fischler, Wood and Atkinson 1971;
Mandler 1967; 1968; Mandler, Pearlstone and Koopmans 1969). In the studies reported by Mandler, subjects sorted items into categories of their own. Subjects were then required to either recall or recognize the items. When given a delayed recognition test of the sorted items, the number of categories identified at encoding was found to be a significant factor. In fact, eventually the number of categories became a more important determinant of recognition than recall performance. To explain the results, Mandler (1980) describes the process of recognition with a dual process theory. In this model, recognition involves two processes: a familiarity check and the retrieval of the context for the event. The familiarity check, an experience of previous encounter (Mandler 1979) or ‘feeling of familiarity’, and the retrieval process occur simultaneously.

Whether the recognition judgment relies more on familiarity or retrieval depends on the instructions, and the penalty for error. Although Mandler (1980) believed that “Retrieval processes involved in recognition are essentially the same as those used in recall tasks” (Mandler 1980, page 256), others believed the process of retrieval varies between the recall and recognition.

Although what was considered ‘conventional wisdom’ in the sixties has been updated to include retrieval in the process of recognition (Mandler 1991), some debate exists about the extent of its role in the process. Anderson and Bower (1972) assert that recognition is a process of searching memory for the event and then checking for a match with the study context. In fact, the research used to specify the ACT model (Anderson 1983b) assumes recognition to be judgment based on retrieval, not ‘feelings of familiarity’. In the ACT model, activation spreads through memory from the context
to the fact; if the level of activation is above a threshold level, the fact is retrieved and compared to to-be-recognized information.

Since recognition may require retrieval at some point in the process, then the ability to interrelate and organize the information at encoding will impact recognition judgments. There should be some systematic differences in the recognition performance of high and low knowledge consumers if HKCs interrelate items at encoding, and if LKCs process the items individually without integration.
3 THE ORGANIZATION OF INFORMATION AND RECOGNITION

Recognition has often been used as the dependent measure in studies investigating how individuals organize information in memory (some examples are Anderson 1974; 1976; 1983; Reder and Anderson 1980; Reder and Ross 1983). The sections following detail some of the reported research results.

The Fan Effect

One robust finding in these studies is that as an individual learns more facts about a concept, the probability of retrieving a specific fact declines, and the length of time required to recognize it increases (Anderson 1974; 1976; Anderson and Bower 1973; Hayes-Roth 1977; Lewis and Anderson 1976; Reder and Anderson 1980; Reder and Ross 1983; Whitlow, Smith and Medin 1982). These findings have been termed the fan effect (see Figure Five). The standard explanation for the fan effect is that the amount of activation available for an activated node is fixed, so an increase in the number of nodes linked to that node reduces the activation available to the linked concept (Reder and Ross 1983). Since the activation flowing to any of the linked nodes is reduced, the time required to retrieve information increases, and the likelihood that the level of activation will exceed the threshold level required to activate the node is also reduced.

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figure five about here
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The Source of Activation and The Fan Effect

The fan effect should occur when there is an increase in the number of facts linked to a concept that is the source of the spread of activation. In a marketing context, the fan effect should occur as the number of attributes linked to a brand increases, the brand fan effect, or as the number of brands linked to a usage situation increases, the usage situation fan effect. The fan effect results in more difficulty retrieving a particular attribute or brand, and will be evidenced by an increase in the time necessary to recognize brand information.

Whether a brand or a usage situation fan occurs depends on whether a brand or usage situation is activated. Consequently, one method for manipulating which occurs is by priming either a brand or a usage situation. Upon presentation of a brand or a usage situation to an individual, "the activation of the concept representing the item increases, and activation spreads throughout the network" (Ratcliff and McKoon 1988, page 385). Priming a concept in memory automatically increases the activation of the concept such that it becomes the source of the spread of activation (Anderson 1983b).

It is important to note a caveat when using priming as an activation manipulation, and when response times are used to identify differences in cognitive structures. A prime causes the activation of the appropriate node. Initially, activation automatically spreads to the linked nodes, however, after 300 to 500 msecs, the individual may direct activation to specific nodes (McKoon and Ratcliff 1979; 1986; Neely 1977). Consequently, it is critical to ensure that the individual does not have control over the spread of activation.
The prediction of a fan effect in recognition assumes that the individual is integrating the attributes associated to a brand, or the number of brands associated to a usage situation, as they are presented.

**The Related Fan Effect**

One criticism of the fan effect is its seeming inability to account for the capability of individuals with a considerable amount of information about a concept to quickly retrieve information about that concept (Smith, Adams and Schorr 1978). This leads to a paradox "... as one becomes increasingly knowledgeable about a topic, one should experience increasing difficulty in answering questions about it. But this runs counter to our intuitions, for it often seems that an increase in our knowledge leads to an increase in both the number of questions we can answer about a topic and the speed with which we do so. This, then, is the paradox ... " (Smith, Adams and Schorr 1978, page 438).

Smith and his colleagues posited that when additional facts linked to a concept are related to the same theme, they are likely to be integrated during encoding, and that fan effects are attenuated as a result. For instance, if a consumer learns three attributes about a camera, s/he would find it more difficult to retrieve any of the attributes than a consumer that just learned about one attribute. However, if all of the attributes pertained to the same usage situation, scuba diving for example, then the expected fan effect would be attenuated. They argued that individuals can overcome the interfering effect of learning new related facts by integrating them with old ones, and that such integration is possible to the extent one has knowledge of how the facts are related. Smith refers to this knowledge that guides the interpretation of facts as 'world
knowledge. The knowledge facilitates integration because: it contains information about possible relations between facts (usage situations for different attributes), and it adds information (how an attribute might affect performance). Integration with 'world knowledge' facilitates retrieval by allowing for more links and a more organized network of links. Smith provided evidence for the world knowledge explanation by asking subjects to recognize facts that were either related to the same theme, or unrelated to a theme. Smith’s description of the information provided to subjects at test was: old statement (related, unrelated) and new statement. They found fan effects when the statements contained old facts that were unrelated to a theme and no fan effects when the old statements contained facts that were related to the same theme.

Exactly why the accumulation of unrelated facts inhibits retrieval performance, while the accumulation of related facts does not inhibit retrieval, became the subject of some debate (Anderson 1980; Anderson and Reder 1987; Reder 1982; Reder and Ross 1983; Smith 1980; Smith, Adams and Schorr 1978; Whitlow 1984; Whitlow, Smith and Medin 1982). The many proposed explanations fall into two general categories: 1] the links between the node and the additional facts are stronger when the facts are related or. 2] there are more links or a different pattern of links when the facts are related. Both Smith’s integration by world knowledge explanation, and Anderson’s extension to the original fan effect explanation fall into the more and different links category. The stronger links category will be discussed first.

Stronger Links. The explanations positing an increase in the strength of the links when the facts are related are as follows:
1] **Retrieval repetition increases strength.** "The decrease in retrieval time may come about because frequently accessed paths are simply traversed faster (Anderson 1976)" (Smith, Adams and Schorr 1978, page 441). In other words, interference does occur as more related facts are linked to a node, however, the interference is counteracted because more knowledgeable individuals retrieve the facts more often.

2] **Rehearsal increases strength.** Bower (1975) asserted that related sets of facts were more interesting than unrelated sets and therefore, would be more likely to be rehearsed. More rehearsal increases the strength of the link between the fact and the node, and therefore, would improve the probability of retrieval enough to counter the interfering effects of other facts. Presumably, the increase in activation for the related facts is at the expense of the unrelated facts, since the capacity of activation is limited. This is not addressed in the explanation.

In a similar explanation, R.C. Anderson (1978) suggested that related statements require more processing. He asserted that the increase in processing would be either in the form of 'deeper' processing, or more rehearsal. Again, the link between the fact and the node will be stronger due to the 'deeper' processing.

The difference between the explanations is when the deeper processing or rehearsal takes place, at encoding or at retrieval. The explanations are discounted by the results of a study by Smith, Adams and Schorr (1978) which demonstrates that

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4 Discussed in Smith, Adams and Schorr (1978) without reference. Possibly the explanation was described in some form of personal communication.

5 Discussed in Smith, Adams and Schorr (1978) without reference. Possibly the explanation was described in some form of personal communication.
varying the opportunity to rehearse the statements does not explain the attenuation of the fan (experiment three).

More Links. In addition to Smith’s ‘integration by world knowledge’ explanation, there are two explanations positing that when facts are related there is an increase in the number and/or pattern of links to the facts. In the first explanation the number, and the pattern of links, changes with repeated retrieval occasions, while the second explanation suggests that the changes in the number, and pattern of links, occurs during encoding. The explanations are discussed here:

1] Frequent access changes the number of links. “The decrease in retrieval time may come about because frequently accessed paths ... are somehow accessed as single units (Hayes-Roth 1977)” (Smith, Adams and Schorr 1978, page 441). The additional facts learned about a concept eventually become a ‘chunk’ of information after repeated retrieval, therefore eliminating fan effects. Hayes-Roth (1977) demonstrated a reduction in the fan effect after repeated trials. Smith and his colleagues question the likelihood that all facts would be retrieved frequently enough to counter the increase in interference caused by the additional facts, particularly since the attenuation in Hayes-Roth’s study came after 11 trials.

2] Thematic coherence changes the pattern of links. In response to Smith’s criticism, Reder and Anderson (1980) extended their explanation for the fan effect. They posited that during the encoding of related facts, a subnode is constructed that organizes thematically coherent material. See Figure Six.
In summary, two alternative explanations have been posited to explain why the accumulation of facts does not necessarily inhibit retrieval. The first, stronger links, has not been supported empirically. The second, more and different links, has been supported empirically, however, there is a controversy concerning the conditions when it will occur. While Smith suggested that integrating by world knowledge would facilitate retrieval because of the improved organization of the information, Reder and Anderson (1980) proposed that the increase in related facts would cause re-organization and a change in the strategy used during recognition. When individuals organize related facts into a subnode, they may retrieve the subnode instead of the fact. This is an efficient strategy if the new statements, or foils, are unrelated to the theme of the old, or target statements. If there is a match between the theme in the statement to be recognized, and the theme represented by the subnode, then the item is judged as old. For instance, the decision as to whether the statement has been seen before or not may be based on the following logic "all of the attributes for this brand were related to the ease of use benefit, this one is not, so I must not have seen it before" or "all of the attributes for this brand were related to the ease of use benefit, this one is also related to that usage situation, so I must have seen it before". It is quicker to make this type of 'sensibility' judgment than to verify a fact by retrieval. In this case, the number of facts
about a concept has increased, but response time during recognition has not increased (Anderson and Reder 1987).

According to Anderson all of the foils in Smith’s studies were not related to a theme, and therefore, could be recognized accurately with ‘sensibility’ judgments. In other words, Anderson’s description of the information used by Smith was: old statements (related, unrelated), and new statements (unrelated). Reder and Anderson showed that if the new statements were related to the theme, subjects would need to search each of the links connected to the subnode, so there would be a fan effect from the subnode. When foils are unrelated to a theme, the fan effect for related target statements should attenuate, but when foils are related to the theme, then a fan effect for related statements should occur due to the necessary search through memory.

**Retrieval - The Integration versus the Subnode Hypothesis**

Both Smith’s integration model and Anderson’s subnode/sensibility hypothesis propose that facts are integrated into a network at encoding. The difference between the theories lies in the retrieval process. Anderson suggests that when the subject can, s/he will only refer to the subnode (or theme) and will make a sensibility judgment based on the subnode. Of course, this strategy is only effective when the foils are not related to the same theme. If Anderson’s subnode model is correct, then recognition judgments should be made more quickly in the related fan condition because a sensibility judgment recognition strategy is, at least, possible. If sensibility judgments are used when the foils are unrelated, then recognition judgments will be faster, and fewer false alarms should occur. When the foils are related, recognition judgments...
should be made by retrieving the information, which takes more time, and therefore does not result in the attenuation of fan effects.

On the other hand, Smith suggests that the information is retrieved both when facts are related or unrelated, but that the more organized structure for the related facts facilitates retrieval. If Smith's integration model is correct, the individual that is able to integrate facts will respond more quickly when the facts are related compared to a condition when the facts are unrelated, regardless of the relatedness of foils at recognition.

To summarize, support for Anderson's subnode/sensibility model will be claimed if: 1] related foils in the related fan condition require more time to recognize as foils (or correctly reject), and 2] unrelated foils require less time to correctly reject. Support for Smith's integration by world knowledge model will be claimed if recognition judgments require less time for a response in the related fan condition, regardless of whether the foil is related or unrelated.
4 HYPOTHESES

High Knowledge Consumers

It is hypothesized that HKCs organize brand information into a network of relations between brands, attributes and usage situations at encoding. The integrative processing of the HKC hypothesized here is consistent with both Anderson's subnode/sensibility model and Smith's 'integration by world knowledge' model. The HKC is hypothesized to use existing knowledge structures to 'see' relations, and to create links between brands, attributes and usage situations. The HKC will require more time to recognize information as the number of unrelated nodes linked to a concept increases. In a marketing context, this could be as the number of attributes associated to different usage situations, and therefore, unrelated facts, linked to the same brand increases. This could also be as the number of brands associated with different attributes, and therefore, unrelated facts, linked to the same usage situation increases. Also, the HKC will require less time to recognize information as the number of related nodes linked to a concept increases. In a marketing context, this could be the number of attributes related to the same usage situation, and therefore related facts, linked to the same brand increases.

Low Knowledge Consumers

It is hypothesized that LKCs do not integrate information. LKCs will treat each new piece of information as unrelated to other pieces of information. This type of processing will have important ramifications during recognition. First, because recognition is heavily reliant on distinguishing one statement from another, processing
the items separately actually facilitates recognition. Therefore, the unintegrated processing of the LKC may be useful during recognition. Second, because LKCs do not integrate information during encoding, the number of attributes linked to a brand or a usage situation, and their relatedness will have little impact on the speed of retrieval. Specifically, response latency during recognition will not vary with the amount of facts or their relatedness.

**Knowledge Level, Amount and Relatedness of Information and Recognition**

Specific hypotheses are as follows:

H4: The increase in response time during recognition as more unrelated facts are linked to a brand or usage situation node, will be greater for HKCs than for LKCs.

H5: The increase in response time during recognition as more facts are linked to a brand or usage situation will be attenuated when the facts are related. The attenuation will be more evident in the response times of HKCs than LKCs.

H6: a] HKCs will recognize product information more quickly when foils are unrelated, and will correctly reject product information more slowly when the foils are related, when the number of related facts about a brand or usage situation increases (Anderson's subnode hypothesis).

or

b] HKCs will be faster when recognizing product information than LKCs when the number of related facts about a brand or usage situation...
increases regardless of the relatedness of the foils (Smith's integration model).
5 OBJECTIVE AND INTRODUCTION TO STUDY THREE

The study is designed to test whether consumers interrelate items at encoding. It is hypothesized that HKCs integrate the information at encoding and LKCs do not. The pattern of recognition latencies and accuracy for the HKC should be the same as has been reported in past research where fan effects occur with the introduction of additional unrelated facts, and are attenuated when the additional facts are related. The pattern of recognition latencies and accuracy for the LKC should be the same as has been reported in conditions where the subject is assumed to store each new fact independently (all brand claims are not related to other brand claims).

The study tests hypotheses four, five and six. In the study, the subjects see brand attribute statements that vary according to: 1) the number of statements made about a brand or a usage situation, and 2) whether the attributes in the statements are related to other brands or other usage situations. The hypotheses will be tested by comparing the response times, and errors within and between the knowledge levels.
6 DESIGN

Study Design

Subjects see product information in the format of brand-attribute pairs at study and are asked to recognize the statements at test. At study, subjects see a brand with one or three attributes. When three attributes are linked to a brand they are either related to the same usage situation (related fan) or they are related to different usage situations (unrelated brand fan). When only one attribute is linked to a brand, it is either related to the same usage situation as other brands (unrelated usage situation fan) or it is not (no fan). See Figure Seven for a diagrammatic explanation. Recognition latency and accuracy are the dependent measures.

At test the statements are either primed by brand or by usage situation. The prime manipulation varies the source of activation which in turn varies the relatedness of the information and the amount of attributes. See Figure Eight. For instance, if a brand is linked to three facts which are linked to different usage situations, the facts are unrelated if the brand is the source of activation. Activation flows to all three facts, but then on to different usage situations (three facts, unrelated). However, if the source of activation is one of the usage situations then the activation flows to one attribute only that is related to other attributes (one fact, related). It is for this reason that each of the prime conditions will be analyzed individually.
The design is a 2 x 2 x 2 x 2 mixed factorial design with one between subject factor and three within subject factors. The between subject factor is Level of Knowledge (high, low). The within subject factors are: Number of Attributes Associated to a Brand (1, 3), the Relatedness of the Attributes (related, unrelated) and the Type of Prime (brand, usage situation). The Number of Related Attributes and the Relatedness of the Attributes are encoding manipulations. The Type of Prime is a retrieval manipulation.

Stimulus Design

The List. A list of twenty-four of a possible forty-eight brand attribute statements was randomly generated for each subject. The following conditions were satisfied in the preparation of each list:

1) There were two of each fan condition in the list of 24 statements.
2) One of each of the fan conditions were present in the first twelve statements, and one of each of the fan conditions were present in the second twelve statements.
3) Whether a particular statement was a target or foil statement were randomly assigned.
4) Brand names were randomly assigned to statements.
51) No two statements concerning the same brand or the same usage
situation were seen one after the other.

**Brands.** The product category is cameras. The brand names are five letter
nonsense words. The brands used in this study are the same brands used in Study
Two. The brands have no significant pre-experimental association with existing brands
(pretest one), and are equivalent in terms of their memorability (pretest two). Pretest
One required forty undergraduate students to read each of the hypothetical brand
names and: 1] list any characteristics that come to mind when reading the names, 2]
rate their familiarity with the names, and 3] list any brand names (camera or otherwise)
that came to mind when reading the names. Pretest Two required twenty
undergraduate students to read each of the hypothetical names and to: 1] rate them as
to their 'ease of use' and. 2] recall them ten minutes later. For further details, refer to
Study Two in Chapter Three.

**Usage Situations and Attributes.** The usage situations for the related fan
were: 1] a camera for use by a professional photographer. 2] a camera that was
suitable for a beginner. 3] a camera that was appropriate for travelling. and 4] an
underwater camera for scuba divers and snorkelers.

**Pretest Three - Relatedness of the Attributes**

A sample of 40 undergraduate students from the University of Toronto
participated in a pretest designed to test whether the attributes were perceived as
related in the related fan condition and unrelated in the unrelated fan condition. The
first 20 students saw twenty four camera attributes and were asked to rate each
attribute as to “How appropriate it would be if you were going to use the camera for ... (travelling/ underwater photography/ professional photography/ amateur photography)?”. A thirty cm continuous scale was anchored with ‘not at all appropriate’ and ‘very appropriate’. This information is the basis for the preparation of related or unrelated brand-attributes statements.

The second 20 students read sets of related brand attribute statements, and appropriateness of the brand for a usage situation on the basis of the set of three statements. For instance, one of the sets of statements were:

“Clibo cameras have a quick rewind, great during fashion shoots.”
“Clibo cameras are compatible with the film types required by professionals.”
“Clibo cameras produce large negatives, ideal for portrait photography.”

Subjects then used a Likert scale anchored with 'strongly agree' (5) and 'strongly disagree' (-5) at the ends and 'don't know' (0) in the middle, to indicate whether they agreed with the following two statements:

“Clibo brand would be suitable for a professional photographer.”
“Clibo brand would be suitable for a beginner or an amateur photographer.”

Subjects also rated their knowledge level in the product category on a ten point scale anchored with 'expert' and 'novice'.

Subjects indicated agreement with the first usage situation (HKCs = 4.6 and LKCs = 4.7 of 5), and a neutral evaluation or disagreement with the second usage
situation for the second usage situation above (HKCs = -1.95 and LKCs = -2.1 of 5). Subjects also read sets of brand attribute statements that were unrelated and asked to rate their agreement with the brands' appropriateness for particular usage situations. Subjects indicated that they "didn't know" if the brand was appropriate to any of the usage situations (HKCs = -0.9, LKCs = .02). The evaluations were not significantly different than zero (t = -.59, p > .10). These results indicate that the related facts imply a theme or in this case a usage situation, while the unrelated facts do not. The results also reveal that both high and low knowledge subjects are able to infer the usage situation when they see a limited set of the statements simultaneously.

The Recognition Stimuli. Subjects see 48 brand-attribute statements at test (see Stimulus Three in Appendix F). The test list included all 24 target statements and 24 foil statements. There were two types foil statements: related foil and unrelated foil statements. Related foil statements include a 'new' attribute (not in the study list) that is related to the usage situation associated to the brand in the study list. Unrelated foil statements include an 'old' brand and an 'old' attribute (in the study list), but not an 'old' association (see Figure Nine). Unrelated foils may encourage subjects to use sensibility judgments.

6 The correlations between the responses are not significant. This is partially due to the fact that there was little variance in the agreement that the attributes implied a usage situation (standard deviation = .26), and much more variance when answering the second type of question (standard deviation = .78). Subjects ranged from 'don't know' to 'not at all appropriate' in an unsystematic way.
Measures and Manipulations

Dependent Measures. Recognition judgments are made on a computer. Subjects see each of the test statements on a screen. Subjects are instructed to press a key marked 'Yes' if they believe that the statement was seen at study, and to press a key marked 'No' if they believe that the statement was not included in those seen at study. Both the time required to make the judgment and the response itself are captured by the computer.

Independent Measures. Both objective and subjective measures were taken to capture both expertise and familiarity with the product. The measures of knowledge were the same as those used in Study Two. See Measure Two in Appendix C.

Objective Measures. Subjects were asked to provide definitions for terms used to describe the process of taking photos, such as 'depth of field' and for attributes of cameras such as 'f-stop'.

Subjective Measures. Subjects were asked to rate their familiarity, usage and knowledge on ten point scales. The anchors for these scales are not very familiar / very familiar, not very often / very often and novice / expert, respectively.

The sum of each subject's responses were used to indicate their level of knowledge. The Cronbach coefficient alpha is .79 which indicates an acceptable degree of internal consistency. All of the correlations between the individual objective
and subjective measures are significant at $p < .01$ (see Correlation Matrix Three in Appendix E). The distribution of scores on the knowledge measure is generally uniform with a slight skew in the tail on the high knowledge end of the distribution ($\text{skewness} = 1.65$). The subjects were divided into two groups with a median split on their knowledge score. There are 37 HKCs and 34 LKCs, since there were three subjects with the median score.

**Priming.** Each subject sees the test list twice, once with each of the priming conditions: brand and usage situation. The order of priming is counterbalanced across subjects, such that approximately half of the subjects see the brand prime condition and the other half see the usage situation prime. Assignment to the order of the primes is random.

The study was designed so that the prime manipulation (brand or usage situation) could be either a within or a between subject manipulation. Within subject manipulations are preferred since they yield a more powerful statistical test because they eliminate the between subject error (Hair, Anderson and Black 1987), however, they are subject to potential test re-test bias. In this case, subjects were asked to make a recognition judgment twice to the same statement. If testing effects are found, then the first block of trials will be used and the prime manipulation will be analyzed as a between subject factor.

An ANOVA of response accuracy with presentation block (first or second) nested within subject, and prime type (brand, usage situation) reveals presentation block as a significant factor for both HKCs ($F(73, 544) = 2.93, p < .0001$) and LKCs ($F(67, 482) =$
2.46, $p < .0001$). This indicates that there was a retest effect because the subjects were significantly different in their ability to recognize the statements the second time they saw each statement compared to the first. An ANOVA of response time with presentation block (first or second) and prime type (brand, usage situation) also reveals presentation block as a significant factor for both HKCs ($F(73, 3115) = 17.1, p < .0001$) and LKCs ($F(67, 2770) = 13.9, p < .0001$). This also indicates a retest effect since subjects were faster the second time they had to recognize an item. Taken together, subjects were faster to respond in the second block, but less accurate. For these reasons, only the first trial block for each subject is included in the analysis. The manipulation is, therefore, between subject.
7 PROCEDURE

Seventy-four students from the University of Toronto were recruited from an undergraduate commerce class and offered course credit in exchange for participation. Subjects were told that the purpose of the study was to test brand names for a new brand of camera.

Subjects saw twenty-four brand attribute statements about cameras on the computer screen in front of them and were asked to rate the appropriateness of the brand name given the attribute using a nine point scale anchored with 'not at all appropriate' to 'very appropriate'. This processing task was intended to ensure the subject thought about the brand, the attribute and the association between them. See the Instruction Three in Appendix G for full text.

After reading unrelated material for ten minutes, subjects saw two blocks of 48 statements and were asked to indicate whether they recognized the statement from the study list. The statement appeared on the screen until the subject indicated whether they had seen the statement earlier by striking a key on a computer keyboard marked 'Yes' or not by pressing the key marked 'No'. When the subject was ready to continue, they pressed 'enter' and the next statement appeared. See the Instruction Four in Appendix G for full text. The order of presentation of the statements was randomized for each subject and within each block.

7 One of the statements in one of the usage situation fan sets was incorrectly formatted. The recognition responses to the set and the foils were removed from the analysis.
8 RESULTS

Response Time Distribution: An examination of the distribution of response times indicated there were a number of outliers. Any response time that was two standard deviations or beyond from the mean response time for that subject were removed from the analysis. Only 3.7% of the observations were removed.

Speed Accuracy Tradeoff

When making recognition judgments, subjects may either carefully consider their responses and make few errors or respond faster and make more errors. In order to validly interpret response times, subjects must use the same strategy in all conditions. Failure to do so would be indicated by a significant positive correlation between response time and hits, and a significant negative correlation between response time and false alarms.

The data collected in this study does not demonstrate a speed-accuracy tradeoff. The overall correlation of hits and response time is not significant (-.0039, p > .10), nor is the correlation between response time and false alarms (.0088, p > .10). When the two knowledge levels are considered individually, the correlations remain insignificant except for the response time - false alarm correlation which is marginally significant (-.0498, p > .10) for HKCs. This indicates that HKCs may, in circumstances to be discussed in the hypothesis testing section, make false recognitions more quickly. In general, taking longer to respond to the recognition question did not improve the accuracy of the response. This result may be due to the low level of recognition performance which is addressed later in the limitations section.
Knowledge level and Response time. When all of the statements are included (target and foil), HKCs recognized brand information faster than LKCs. HKCs took an average of 2726 msecs, while LKCs took 3447 msecs (p < .0001).

Hypothesis Testing

Hypothesis 4 asserts that HKCs will be more susceptible to unrelated fan effects than LKCs. Specifically, HKCs will increase their response time when recognizing product information more than LKCs when the number of unrelated facts about a brand or usage situation increases (unrelated fan). Hypothesis 5 asserts that HKCs will be more susceptible to related fan effect than LKCs. Specifically, hypothesis 5 states that HKCs will reduce their response time when recognizing product information more than LKCs when the number of related facts about a brand or usage situation increases (related fan). Support for these hypotheses will be claimed if there is a three way interaction between knowledge level, relatedness and amount of information provided for each of the prime conditions.

The results support the hypotheses. A three way ANOVA of response times for correctly recognized target statements in the usage situation prime condition reveals one significant main effect for knowledge level ($F(1, 367) = 20.35, p < .0001$) with HKCs responding more quickly than LKCs. There is also a significant interaction between knowledge level and the amount of information ($F(1, 367) = 4.78, p < .05$). And importantly, there is significant three way interaction between knowledge level, relatedness and amount of information provided ($F(1, 367) = 4.26, p < .05$).
In the interest of the interpretation of the three way interaction - an ANOVA of response times for correct responses in the usage situation prime condition for HKCs only reveals a significant interaction between related and amount factors \( (F(1, 235) = 11.66, p < .001) \). HKCs take longer to respond to as the number of unrelated facts increase and less time to respond when the number of related facts increase. HKCs responded more slowly when three unrelated facts were learned than when one fact was learned. Also HKCs respond more quickly when three related facts are learned than when three unrelated facts are learned. An ANOVA of response times for correct responses in the usage situation prime condition for LKCs reveals a significant effect for the amount of facts associated to a usage situation \( (F(1, 132) = 4.37, p < .05) \). LKCs are slower to respond as the number of facts increase. See Table Twelve.

A three way ANOVA of response times for correctly recognized target statements in the brand prime condition reveals a significant main effect for knowledge level \( (F(1, 362) = 40.4, p < .0001) \) with HKCs responding more quickly than LKCs. Importantly, there is a marginally significant three way interaction between knowledge level, relatedness and amount of information provided \( (F(1, 362) = 3.68, p = .10) \). Again, to interpret the interaction, separate ANOVAs for high and low knowledge consumers were run. An ANOVA of response times for correctly recognized target statements in the brand prime condition for HKCs only reveals a significant effect for the relatedness of the facts \( (F(1, 194) = 7.43, p < .01) \). HKCs take longer to respond when facts are related compared to when facts are unrelated. The ANOVA also reveals a significant interaction between the relatedness and amount of information factors \( (F(1, ...
HKCs recognize information more quickly when three unrelated facts are learned than when one fact is learned, and more quickly when three related facts are learned than when three unrelated facts are learned. An ANOVA for LKCs in the brand prime condition reveals no significant effects. See Table Twelve. Observation of the unrelated fan effect and the related fan effect in the response times of the HKCs supports the general hypothesis that HKCs integrate new information. See Table Twelve.

Two of the explanations for the related fan effect are the subnode explanation and the integration explanation. Hypotheses 6a and 6b are designed to test whether the data supports either of these explanations. Hypothesis 6a asserts that less time will be required for HKCs to respond to an unrelated foil than a related foil in the related fact condition. This assertion assumes that HKCs will make sensibility judgments when the foil is unrelated, instead of retrieving the information. Support for Anderson's subnode/sensibility model will be claimed if an ANOVA of response times for the foil statements by HKCs reveals a significant three way interaction between the amount of information, the relatedness of the information, and the foil type (related, unrelated).

The three way ANOVA reveals a significant main effect for relatedness of the facts ($F(1, 799) = 4.05, p < .05$), a significant interaction between relatedness and amount of information ($F(1, 799) = 4.24, p < .05$), and a significant three way interaction
\( F(1,799) = 9.92, \ p < 0.005 \) between relatedness and amount of information and foil type (related, unrelated). The mean responses time for HKCs in the related fan condition was 2603 msecs when the foil was unrelated, and 2313 msecs when the foil was related (\( p < .05 \)). These results are in the opposite direction to those predicted by Anderson's sensibility explanation and, therefore, do not support the hypothesis. See Table Thirteen. The results for the same ANOVA for LKCs yields insignificant results for the three way interaction.

Hypothesis 6b asserts that HKCs will be faster to identify foil statements when more related facts are presented about the same brand, regardless of the relatedness of the foil. This assertion is made on the basis that because the information is better integrated during encoding, recognition should be faster. Support for the integration explanation will be claimed if an ANOVA of response times for the foil statements for HKCs revealed a significant interaction between relatedness and amount of information, but a non-significant three way interaction between relatedness and amount of information. The hypothesis is not supported. As reported above, the interaction between relatedness and amount of information is significant, but so too is the three way interaction. The data does not support Smith's integration by world knowledge explanation. An important caveat of this result is the recognition performance rate to be discussed in the limitations section.
9 LIMITATIONS OF STUDY THREE

Subjects in Study Three were asked to read 24 statements about 16 different brands of cameras. Later, when they were asked to identify which of the 48 test statements they had seen earlier, both high and low knowledge subjects found it very difficult to discriminate between target (old) statements and foil (new) statements. Recognition sensitivity is accurately tested by a statistic that accounts for both the ability to recognize the target statements and the ability to recognize foil statements. MacMillan and Creelman (1991) suggest the use of a sensitivity statistic, $\alpha$, from Choice Theory (Luce 1963) which includes both the hit rate and the false alarm rate in its derivation. In the case of complete inability to discriminate $\alpha = 1.0$. In this study the $\alpha$ for HKCs is 1.6 and is 1.1 for LKCs. The $\alpha$ level for LKCs is not significantly different than one ($t = -0.45, p > .10$), which indicates that they are not able to discriminate between new and old items. The $\alpha$ level for HKCs is significantly different than one ($t = -7.33, p < .0001$), which indicates that they are able to discriminate between new and old items, albeit at a relatively low level of sensitivity.

An alternative explanation for the results might be that the subjects were so confused by the sheer quantity of statements about unfamiliar brands that they simply guessed during the recognition test. Thus, it was only in the related fan condition when the subject heard the same brand name with an attribute that implied the same usage situation three times that the subject had any chance of guessing correctly. For this

$$\alpha = \frac{\text{hit rate}}{1 - \text{false alarm rate}} = \left(1 - \text{hit rate}\right) \text{false alarm rate}$$

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reason the study was run again with half as many statements at study, and therefore half as many statements at test.
10 STUDY THREE A

The design, stimulus materials, procedures and measures for Study Three A are the same as Study Three with the following exceptions:

1] only one of each of the fan conditions is included in the study session, therefore subject sees 12 statements during the study session,
2] there are only 24 statements at test, and
3] the prime is a between subject manipulation, therefore subjects see only one test block.

Procedure

Seventy-seven undergraduate students from the University of Western Sydney participated in the study in exchange for course credit.

Subjects saw twelve statements randomly selected from the twenty-four brand-attribute statements about cameras, on the computer screen in front of them. As in Study Three, brand names were randomly assigned to the statement for each subject, and no two statements concerning the same brand or the same usage situation appear sequentially. Subjects were asked to rate each of the brand names on their appropriateness given the attribute in the statement.

Following the rating task, subjects read unrelated material for ten minutes. At test, subjects saw all twenty-four statements (twelve target statements and twelve foil statements) and were asked to indicate which of the statements they had seen earlier during the study session. Subjects indicated their response on a computer keyboard by striking keys marked ‘Yes’ or ‘No’. When the subject was ready to continue they
pressed 'enter' and the next statement appeared. The computer captured both the time required to respond and the response itself.

Subjects then completed a knowledge questionnaire, were debriefed and thanked for their participation in the study.

**Knowledge Measure**

The knowledge measure was the same questionnaire used in Studies Two and Three. The sum of each subject's responses to the objective and subjective knowledge questions were used to indicate their level of knowledge. The Cronbach coefficient alpha is .80 which indicates an acceptable degree of internal consistency, and is similar to the sample in Study Three. All of the correlations between the individual objective and subjective measures are significant at $p < .0005$ (see Correlation Matrix Four in Appendix E). The distribution of scores on the knowledge measure is generally uniform with a slight skew in the tail on the high knowledge end of the distribution ($\text{skewness} = .45$) which is also similar to the sample in Study Three. The subjects were divided into two groups, high and low knowledge consumers, with a median split on their knowledge score. The result is 39 HKCs and 38 LKCs.

**Results**

As expected, subjects were more accurate in their recognition of the target statements in this study. Accuracy is measured with Luce's $\alpha$, a statistic that measures the subject's ability to distinguish between target and foil items. If the subject is totally unable to discriminate between target and foil, $\alpha = 1.0$. If the subject is correct 75% of the time for both targets and foils, then $\alpha = 3.0$. The $\alpha$ for HKCs is 6.7 and the $\alpha$ for
LKCs is 8.0. A three way ANOVA of the $\alpha$ statistic reveals that the fan condition factor, or the relatedness by amount of information interaction, is not significant ($F(1, 337) = 0.38, p > .10$). Clearly, the subjects in this study were able to discriminate between targets and foils in all fan conditions.

Hypothesis 4a states that HKCs will increase their response time when recognizing product information more than LKCs when the number of unrelated facts about a brand or usage situation increases. Hypothesis 5 states that HKCs will reduce their response time when recognizing product information more than LKCs when the number of related facts about a brand or usage situation increases. The results from Study Three A support the hypotheses. A three way ANOVA of response times for correctly recognized target statements in the usage situation prime condition reveals significant effects for knowledge level ($F(1, 257) = 7.2, p < .01$) and for the relatedness of the information ($F(1, 257) = 4.38, p < .05$). HKCs respond more quickly than LKCs. All subjects respond more quickly when the information is related. There is a significant interaction between knowledge level and relatedness ($F(1, 257) = 7.9, p < .01$). The response time of HKCs varies more with the relatedness of the information than does the response times for LKCs. There is also a significant interaction of knowledge level and amount of information ($F(1, 257) = 6.61, p < .01$). HKCs recognize information more slowly as the number of brands linked to the usage situation increases. Importantly, the three way interaction between knowledge level, the relatedness of the information and the amount of information provided is significant ($F(1, 257) = 13.80, p < .001$).
To interpret the three way interaction, separate ANOVAs for high and low knowledge consumers were run. An ANOVA of the response times in the usage situation prime condition for HKCs reveals a significant interaction for the amount and relatedness of the information (F(1, 182) = 3.85, p < .05). HKCs are quicker to recognize information when they learned three related facts than when they learned three unrelated facts, and they are slower to recognize information when they learned three unrelated facts than when they learned one fact. An ANOVA of the response times in the usage situation condition for LKCs reveals no significant effects or interactions. The unrelated fan effect and the related fan effect are more evident in the response times for HKCs than LKCs.

A three way ANOVA of response times for correctly recognized target statements in the brand prime condition reveals the same significant three way interaction (F(1, 295) = 4.63, p < .05). An ANOVA for HKCs reveals a significant interaction of the relatedness and the amount of information (F(1, 194) = 4.05, p < .05). HKCs are quicker to recognize information when they learned three related facts than when they learned three unrelated facts, and they are slower to recognize information when they learned three unrelated facts than when they learned one fact. An ANOVA of the response times in the usage situation condition for LKCs reveals no significant effects or interactions. The unrelated fan effect and the related fan effect are more evident in the response times for HKCs than LKCs. See Table Fourteen for cell means. Hypotheses 4a and 5 are supported. The response time results in Study
Three A. when the subjects are able to discriminate between target and foil statements, are consistent with the response time results in Study Three.

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table fourteen about here
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Two of the explanations for the related fan effect are the subnode explanation and the integration explanation. Hypotheses 6a and 6b are designed to test whether the data supports either of these explanations. Hypothesis 6a asserts that less time will be required for HKCs to respond to an unrelated foil than a related foil in the related fan condition. Support for Anderson’s subnode/sensibility model will be claimed if an ANOVA of response times for the foil statements by HKCs reveals a significant three way interaction between the amount of information, the relatedness of the information, and the foil type (related, unrelated). Hypothesis 6b asserts that HKCs will be faster to identify foil statements when more related facts are presented about the same brand, regardless of the relatedness of the foil. This assertion is made on the basis that because the information is better integrated during encoding, recognition should be faster. Support for the integration explanation will be claimed if an ANOVA of response times for the foil statements for HKCs revealed a significant interaction between relatedness and amount of information, but a non-significant three way interaction between relatedness and amount of information. Neither hypothesis is supported, the ANOVA reveals no significant effects or interactions. See Table Fifteen for cell means.
Summary

The accuracy in Study Three is low, but results from Study Three A indicate that the pattern of results are the same when the subjects are able to discriminate between old and new statements. The inferences drawn from Study Three should not be discounted because of the accuracy level. The response time data and errors indicate that HKCs are more susceptible to related and unrelated fan effects than are LKCs.
11 DISCUSSION

The intention of the investigation in Studies Three and Three A was to provide further evidence that HKCs integrate and organize the information into an associative network. The results indicate that during encoding the HKC integrates brand, attribute and usage situation information. It is this integration that causes the HKC to be susceptible to related fan effects and related fan effects. The integration also allows them to use other strategies during recognition such as sensibility or consistency judgements. It may be that HKCs have the opportunity and ability to process in this manner while LKCs do not. This is a question that requires more research to answer.

The LKC does not integrate the information at encoding. This is clear because the number of attributes related to a brand and whether the attributes related to the same usage situation had no effect on the time required to later recognize the material.
CHAPTER FIVE
Contributions and Future Research

1 DISCUSSION OF THE RESULTS

In memory-based decision making, a brand must be retrieved from memory by the consumer before it can be chosen. Understanding what brands will be retrieved from memory is important not only because brand retrieval is a necessary condition for choice, but because the brands retrieved create the context for brand evaluation.

Results and Contributions

The objective of this dissertation was to investigate how the level of knowledge of a consumer affects the amount of integration during encoding, and its influence on the process of brand retrieval. The results of the first study reveal that consumers with little knowledge about the product category retrieve the same set of brands regardless of the usage situation at retrieval. The explanation provided for this result is that low knowledge consumers do not integrate information at encoding, instead they use the encoding situation to form a set of brands to be retrieved on all subsequent retrieval occasions. Study Two was designed to investigate whether low knowledge consumers process in this non-integrative manner. The results of the first study also reveal that high knowledge consumers tend to retrieve a set of brands appropriate for the retrieval setting. The explanation provided for this result is that high knowledge consumers do integrate information at encoding into a network of brands, attributes and usage situations. This integration allows for a search through memory at retrieval which
facilitates the construction of the retrieval set at retrieval. Study Three was designed to investigate whether high knowledge consumers integrate facts about brands over usage situations when encoding new brand information. The set of studies are designed to investigate the timing of the construction of the retrieval set, and then to consider whether it is the degree of integration at encoding that might explain the differences in set construction.

**Study One.** It is claimed that low knowledge consumers form the retrieval set at encoding because the brands most likely to be recalled are important to the usage situation present at encoding. On the other hand, consumers with more product knowledge vary the brands retrieved as the usage situation at retrieval changes. This result provides evidence that high knowledge consumers form the retrieval set at retrieval by searching through memory for the most appropriate brands. Although the evidence in the first study is consistent with the general hypotheses that high knowledge consumers integrate information at encoding, and low knowledge consumers tend to do less integration during encoding, other explanations exist. Studies Two and Three are designed to rule out the alternative explanations.

**Study Two.** The second study examines the hypothesis that low knowledge consumers encode a set of brands as a list based on the encoding setting without forming an integrated network of brands, attributes and usage situations. The design is fashioned after previous research that is specifically designed to discourage integration during encoding. This previous research indicated that primacy effects are more evident when integration at encoding does not occur. Therefore, low knowledge
consumers are hypothesized to demonstrate primacy effects when learning a number of brand-attribute statements and later asked to recall them. Since consumers with more product knowledge are hypothesized to interrelate the brands during encoding, they should not recall the first few brands with any greater likelihood than the rest of the brands. The results of the study show that low knowledge consumers demonstrated primacy effects in their recall of brands, while high knowledge consumers did not.

**Study Three.** The third study investigates the hypothesis that high knowledge consumers integrate brand information at encoding. Previous research has indicated that, when individuals integrate new information into an associative network, it takes them longer to retrieve information as the number of unrelated facts (attributes) linked to a concept (brand or usage situation) increases. This effect is referred to as an unrelated fan effect. This research has also demonstrated that the fan effect is attenuated when the facts are related in some meaningful way. In study three, recognition accuracy and response time were measured for both high and low knowledge consumers when attributes are either related or unrelated to a usage situation. High knowledge consumers demonstrated unrelated fan effects in recognition latency when additional unrelated attributes are linked to a brand, or when additional unrelated brands are linked to a usage situation. These effects were attenuated when the additional attributes or brands were related. These results support the hypothesis that high knowledge consumers integrate information at encoding.

The recognition accuracy and response latencies of low knowledge consumers do not provide any indication of fan effects. This is consistent with the hypothesis that
they do not integrate information during encoding. Although low knowledge consumers are able to accurately recognize which brands and attributes were studied earlier, they tend to be confused about which attributes were paired with a particular brand. This tendency to confuse brands is an interesting phenomenon that should be explored in further research.

Study three provides another result that is consistent with the hypothesis that LKCs link all statements to the learning episode. If LKCs do organize information in this manner, they should take longer to retrieve any of the specific facts because all of the statements should form a fan from the learning episode. In Study Three, LKCs did take longer to retrieve facts.

The results of the second and third study support the hypotheses developed to explain the results of the first study. Higher knowledge consumer integrate brand information at encoding into a network of brands, attributes and usage situations. This allows the high knowledge consumer to search through memory at retrieval and retrieve the brands that are most appropriate to the usage situation at retrieval. The brands retrieved will vary as the situation at retrieval changes, hence a varied type of retrieval set. Lower knowledge consumers use the encoding situation to help them assess what brands are most important. The low knowledge consumer stores a list of brands linked to the learning episode instead of integrating brand information into a network facilitating a search through memory later. The low knowledge consumer tends to retrieve the same set of brands regardless of the usage situation at retrieval.
Alternative explanations for the results of Study One such as the lack of motivation on the part of LKCs, are ruled out by Study Three. LKCs were equally able to recognize information and still did not provide any evidence of integrative processing. Other explanations such as encoding specificity were partially ruled out by control conditions in Study One. Further evidence excluding the explanation is provided by Study Two and Study Three. In both Study Two and Study Three the encoding and retrieval situations do not vary, and HKCs integrate over brands, attributes and usage situations while LKCs link all statements to the learning episode.
Summary of the Major Contributions

The contributions of this dissertation are:

1] Better specification of the conditions under which the same set of brands or a different set will be retrieved from memory. Specifically, a demonstration of the moderating effect of the level of product knowledge on the process of brand retrieval for memory-based decision settings. The empirical evidence presented here supports a hypothesis put forth by Alba and Hutchinson (1987) that "Consumer knowledge about product categories and attributes influences which brands are frequently recalled together, thereby affecting the composition of the memory-based evoked sets." (page 437).

2] Evidence indicating that higher knowledge consumers tend to process brand information integratively, by interrelating brands, attributes and usage situations. Evidence indicating that lower knowledge consumers tend to process brand information non-integratively, by linking the brand or attribute information primarily to the learning episode.

3] The introduction into the marketing literature of response times in recognition judgments to infer the organization of newly acquired information.

4] Evidence supporting a hypothesis presented in a review of consumer expertise asserting that "The simple accumulation of product-related facts inhibits the recall of any particular fact; however, the previously identified advantages of expertise can compensate for this disadvantage of experience" (Alba and Hutchinson 1987, page 437). The results reported in Study Three indicate that the fan
effects found in research studying the organization of new information in memory are replicated here for high, but not low knowledge consumers.
2 FUTURE RESEARCH

There are three obvious areas for future research. The first area relates the work here to models reported elsewhere considering the relatedness of the material-to-be-learned. The second area examines errors in recognition and their ramifications for marketing communications. The last area is the effect of repeated exposure of the product information, and how that would affect the ability to recognize more or less related information.

For the first area, there is a model existing in the text comprehension literature that relates closely to the type of integration differences found here - the Material Appropriate Processing (MAP) model. However, the model does not include knowledge level differences. In the MAP framework, a consumer may process information about the item itself (item specific information) or information about the item in relation to other items (relational information). The way an individual goes about learning depends on the instructions at learning (McDaniel, Einstein, Dunay and Cobb 1986), the relatedness of the material for study (Einstein and Hunt 1980), and the interaction of the two (McDaniel and Einstein 1989). If the information is perceived to be related, then it is the relation between items that is the focus of processing. If the information is perceived to be unrelated, then the focus of processing is the distinct aspects of each item. Furthermore, processing information about how the items are similar or related facilitates recall and processing the distinguishing characteristics facilitates recognition. Performance on either test is best when both types of processing occur together (Einstein and Hunt 1980; Hunt and
The dual processing effect occurs because both types of information are important to retrieval. Memory performance is best when the material to-be-learned encourages one type of processing and the instructions encourage the other type of processing. It has been demonstrated here that high knowledge consumers process the relations between brands and attributes, while low knowledge consumers do not. The assumption made in the interpretation of the results here is that low knowledge consumers are not able to see the relations between brands, attributes and usage situations. An alternative explanation is that the low knowledge consumer is simply not motivated to process the information in this manner. It would be interesting to consider how altering the instructions at encoding might affect the relation, particularly since it appears that low knowledge consumers do not integrate the information presented over brands (Study One and Two), and it is not clear that low knowledge consumers are able to create strong links between the brand and the attribute (Study Three and Three A). Perhaps a change in the instructions would change the within item processing or integration by low knowledge consumers.

The second area of research concerns the different types of recognition errors made by consumers. Some evidence reported in study three indicates that low knowledge consumers are more likely to confuse brands. Specifically, they are able to identify that they learned about a brand and an attribute during a learning occasion, but tend to confuse what attributes were paired to a particular brand. It would be
interesting to investigate when the brand confusions are most likely, particularly since low knowledge consumers tend to link brands learned within, but not between learning episodes. This presents certain implications for comparative advertising since two brands are compared within the same learning episode.

In study three it is found that high knowledge consumers are more likely to assess the consistency or sensibility of a brand in relation to a certain usage situation and that this becomes part of their recognition judgment. Thus, if a brand positions itself with three attributes as an easy-to-use camera (a point and shoot type of camera, for instance), then the high knowledge consumer is more likely to assume the brand has other attributes typical of 'easy-to-use' brands. It would be interesting to investigate whether these errors are due to the use of sensibility judgments or whether they are due to retrieval errors.

The last area for further research would extend this research by introducing repeated study trials. In each of the studies described here, subjects were exposed to brand information once. In reality, consumers are often, if not usually, exposed to the same product information a number of times. It would be interesting to see if any significant performance differences would occur if consumers were repeatedly exposed to more or less related product information.
REFERENCES


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<tr>
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<td>no usage situation</td>
</tr>
</tbody>
</table>
Table Three

Number of Brands Recalled
by group, by encoding condition

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Recall Session One</th>
<th>Recall Session Two</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HKCs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>5.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.2&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>5.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.3&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>LKC&lt;sub&gt;s&lt;/sub&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>4.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.0&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>3.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.7&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Cell means with the same superscript are not significantly different at $p < .05$ level.
Table Four

Ratio of Relevant to Irrelevant Brands
by group, by encoding condition

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Recall Session One</th>
<th>Recall Session Two</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HKCs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>1.51&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.63&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>1.74&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.50&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>LKC</strong>s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>1.57&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.77&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>0.92&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.05&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Cell means with a subscript of a are significantly different than one.
Cell means with the same superscript are not significantly different at p < .05 level.
Table Five
**Set Composition**
(mean number of usage situation relevant brands,
mean number of usage situation irrelevant brands)
by group, by encoding condition

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Recall Session One</th>
<th>Recall Session Two</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HKCs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>2.95, 2.05</td>
<td>3.12, 2.11</td>
</tr>
<tr>
<td>no usage situation</td>
<td>3.13, 2.20</td>
<td>3.00, 2.33</td>
</tr>
<tr>
<td><strong>LKC</strong>s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>2.65, 2.00</td>
<td>1.33, 1.67</td>
</tr>
<tr>
<td>no usage situation</td>
<td>1.56, 1.81</td>
<td>1.43, 1.31</td>
</tr>
</tbody>
</table>
Table Six

**Set Composition**

Adjustment Variable

by group, by encoding condition

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Adjustment to the Retrieval Set</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HKCs</strong></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>1.88&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>1.60&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>LKCs</strong></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>0.33&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>-0.13&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Cell means with the same superscript are not significantly different at p < .05 level.
Table Seven

Mean number of Brands Previously Unrecalled by group, by condition

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Recovered Brands</th>
<th>Relevant</th>
<th>Irrelevant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HKCs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>1.35&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.24&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.11&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>1.33&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.07&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.26&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>LKC</strong>s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>0.08&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.08&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.00&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>0.18&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.06&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.12&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Cell means with a subscript of a are significantly different than zero.
Cell means with the same superscript are not significantly different at p < .05 level.
Table Eight

Mean Number of Brands Lost
by group, by condition

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Lost Brands</th>
<th>Relevant</th>
<th>Irrelevant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HKCs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>1.11&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0.18</td>
<td>0.93&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>1.34&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0.29</td>
<td>1.05&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td><strong>LKCs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>1.75&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0.75&lt;sub&gt;a&lt;/sub&gt;</td>
<td>1.00&lt;sub&gt;a&lt;/sub&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>0.74&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0.44&lt;sub&gt;a&lt;/sub&gt;</td>
<td>0.34</td>
</tr>
</tbody>
</table>

Cell means with a subscript of a are significantly different than zero at p < .05 level.
Table Nine
Number of Brands Recalled
by group, by encoding condition

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Recall Session One</th>
<th>Recall Session Two</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HKCs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>5.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.2&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>5.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.3&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>restate</td>
<td>5.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.2&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>no u.s. until recall session two</td>
<td>5.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.2&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>LKCs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>4.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.0&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>no usage situation</td>
<td>3.4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.7&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>restate</td>
<td>4.5&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.7&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>no u.s. until recall session two</td>
<td>3.7&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.9&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Cell means with the same superscript are not significantly different at $p < .05$ level.
<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Recall Session One</th>
<th>Recall Session Two</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HKCs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>$1.51^a$</td>
<td>$1.63^a$</td>
</tr>
<tr>
<td>no usage situation</td>
<td>$1.74^a$</td>
<td>$1.50^a$</td>
</tr>
<tr>
<td>restate</td>
<td>$1.64^a$</td>
<td>$1.44^a$</td>
</tr>
<tr>
<td>no u.s. until recall session two</td>
<td>--</td>
<td>$1.71^a$</td>
</tr>
<tr>
<td><strong>LKC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>usage situation</td>
<td>$1.57^a$</td>
<td>$0.77^b$</td>
</tr>
<tr>
<td>no usage situation</td>
<td>$0.92^b$</td>
<td>$1.05^b$</td>
</tr>
<tr>
<td>restate</td>
<td>$1.15^b$</td>
<td>$0.86^b$</td>
</tr>
<tr>
<td>no u.s. until recall session two</td>
<td>--</td>
<td>$0.66^c$</td>
</tr>
</tbody>
</table>

Cell means with a subscript of $a$ are significantly different than one. Cell means with the same superscript are not significantly different at $p < .05$ level.
Table Eleven
Retrieval Probabilities by Presentation Order
by group, by presentation placement

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Retrieval Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Over Lists</td>
</tr>
<tr>
<td><strong>HKCs</strong></td>
<td></td>
</tr>
<tr>
<td>beginning</td>
<td>.23&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>middle</td>
<td>.25&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>end</td>
<td>.27&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>LKC</strong>s</td>
<td></td>
</tr>
<tr>
<td>beginning</td>
<td>.40&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>middle</td>
<td>.15&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>end</td>
<td>.15&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Cell means with the same superscript are not significantly different.
Table Twelve
Response Times for Hits
(in milliseconds)

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Brand Prime</th>
<th>Relatedness of Facts</th>
<th>related</th>
<th>unrelated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HKCs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>one fact</td>
<td>2601&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2653&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>three facts</td>
<td>2527&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3216&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LKCs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>one fact</td>
<td>3513&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3577&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>three facts</td>
<td>4169&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3681&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Usage Situation Prime</td>
<td>Relatedness of Facts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HKCs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>one fact</td>
<td>2796&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2541&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>three facts</td>
<td>2386&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3300&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LKCs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>one fact</td>
<td>3313&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3018&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>three facts</td>
<td>4099&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3598&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Cell means with the same superscript are not significantly different at p < .05 than other cell means in the same knowledge level and the same prime condition.
Table Thirteen
Response Times for Foil Statements for HKCs in Study Three
(in milliseconds)

<table>
<thead>
<tr>
<th>Related Foils</th>
<th>Relatedness of Facts</th>
<th>related</th>
<th>unrelated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Facts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>one fact</td>
<td></td>
<td>2786(^a)</td>
<td>2601(^a)</td>
</tr>
<tr>
<td>three facts</td>
<td></td>
<td>2313(^b)</td>
<td>3006(^c)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unrelated Foils</th>
<th>Relatedness of Facts</th>
<th>related</th>
<th>unrelated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Facts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>one fact</td>
<td></td>
<td>2705(^a)</td>
<td>2882(^a)</td>
</tr>
<tr>
<td>three facts</td>
<td></td>
<td>2603(^a)</td>
<td>2597(^a)</td>
</tr>
</tbody>
</table>

Cell means with the same superscript are not significantly different at \(p < .05\)
### Table Fourteen

**Response Times for hits in Study Three A**

(in milliseconds)

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Brand Prime</th>
<th>Relatedness of Facts</th>
<th>Related</th>
<th>Unrelated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HKCs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>one fact</td>
<td>3365&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3242&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>three facts</td>
<td>3269&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4000&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LKCs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>one fact</td>
<td>3796&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3751&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>three facts</td>
<td>4236&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3582&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

|                 |             | Usage Situation Prime | Relatedness of Facts | Related | Unrelated |
|                 |             | HKCs                 |         |           |
|                 |             | one fact             | 3027<sup>a</sup> | 3180<sup>a</sup> |
|                 |             | three facts          | 3471<sup>a</sup> | 4588<sup>b</sup> |
|                 |             | LKCs                 |         |           |
|                 |             | one fact             | 2881<sup>a</sup> | 3509<sup>a</sup> |
|                 |             | three facts          | 3694<sup>a</sup> | 3256<sup>a</sup> |

Cell means with the same superscript are not significantly different at \( p < .05 \) than other cell means in the same knowledge level and the same prime condition.
APPENDIX B
FIGURES
### Figure One
The Network Structure

**Presented Information**

<table>
<thead>
<tr>
<th>Brand A - Attribute One -</th>
<th>Usage Situation One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand B - Attribute Two -</td>
<td>Usage Situation Two</td>
</tr>
<tr>
<td>Brand A - Attribute Three -</td>
<td>Usage Situation One</td>
</tr>
<tr>
<td>Brand B - Attribute Four -</td>
<td>Usage Situation Two</td>
</tr>
<tr>
<td>Brand C - Attribute Five -</td>
<td>Usage Situation Three</td>
</tr>
<tr>
<td>Brand C - Attribute Four -</td>
<td>Usage Situation Two</td>
</tr>
</tbody>
</table>

**Resulting Organization**

<table>
<thead>
<tr>
<th>Brand A</th>
<th>Attribute One</th>
<th>Usage Situation One</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attribute Three</td>
<td></td>
</tr>
<tr>
<td>Brand B</td>
<td>Attribute Two</td>
<td>Usage Situation Two</td>
</tr>
<tr>
<td>Event</td>
<td>Attribute Four</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attribute Five</td>
<td>Usage Situation Three</td>
</tr>
</tbody>
</table>

Note that the lines connecting brands, attributes and usage situations represent associations or the links created by the associations. Note also that attributes are integrated over brand and usage situation.

---

Elizabeth Cowley | Doctoral Thesis
Figure Two
The List Structure

Presented Information

<table>
<thead>
<tr>
<th>Brand A</th>
<th>Attribute One</th>
<th>Usage Situation One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand B</td>
<td>Attribute Two</td>
<td>Usage Situation Two</td>
</tr>
<tr>
<td>Brand A</td>
<td>Attribute Three</td>
<td>Usage Situation One</td>
</tr>
<tr>
<td>Brand B</td>
<td>Attribute Four</td>
<td>Usage Situation Two</td>
</tr>
<tr>
<td>Brand C</td>
<td>Attribute Five</td>
<td>Usage Situation Three</td>
</tr>
<tr>
<td>Brand C</td>
<td>Attribute Four</td>
<td>Usage Situation Two</td>
</tr>
</tbody>
</table>

Resulting Organization

<table>
<thead>
<tr>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand A</td>
</tr>
<tr>
<td>Brand B</td>
</tr>
<tr>
<td>Brand A</td>
</tr>
<tr>
<td>Brand B</td>
</tr>
<tr>
<td>Brand C</td>
</tr>
<tr>
<td>Brand C</td>
</tr>
</tbody>
</table>

Note that the lines connecting brand to attribute and attribute to usage situation represent the associations made during encoding. There is no brand or attribute integration at encoding. The only associations present are those made explicitly in the presented information and those linking the facts to the learning episode.
Figure Three
Retrieval Probabilities for the Lists

probability of retrieval

- .60 -
- .50 -
- .40 -
- .30 -

HKC

.20 -
LKC

.10 -

List Placement
Figure Four
Retrieval Probabilities for the Session

probability of retrieval

HKC
LKC

List One

List Two

B M E
B M E

Elizabeth Cowley
Doctoral Thesis
<table>
<thead>
<tr>
<th>Fan Effect</th>
<th>Related Fan</th>
</tr>
</thead>
<tbody>
<tr>
<td>f1 t1 f4</td>
<td></td>
</tr>
<tr>
<td>c1 f2 t2 c2 f5 t4</td>
<td></td>
</tr>
<tr>
<td>f3 t3 f6</td>
<td></td>
</tr>
</tbody>
</table>
Figure Six

Related Fan with subnode

\[
\begin{align*}
f_4 \\
c_2 &\quad t_4 &\quad f_5 \\
\phantom{c_2} &\phantom{t_4} &\phantom{f_5} \\
f_6
\end{align*}
\]
Figure Seven
Configuration of Four Fan Conditions if the Prime is the brand

<table>
<thead>
<tr>
<th>Number of Attributes (1)</th>
<th>Attributes related to a usage situation</th>
<th>Attributes not related to a usage situation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Usage Situation Fan</td>
<td>No Fan</td>
</tr>
<tr>
<td></td>
<td>Related Fan</td>
<td>Brand Fan</td>
</tr>
</tbody>
</table>

List Configuration

$B = \text{brand}$  
$A = \text{attribute}$  
$US = \text{usage situation}$

<table>
<thead>
<tr>
<th>Brand Fan</th>
<th>No Fan</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 US1</td>
<td>B3 A7 US5</td>
</tr>
<tr>
<td>B1 A2 US2</td>
<td>B4 A8 US6</td>
</tr>
<tr>
<td>A3 US3</td>
<td>B5 A9 US7</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Related Fan</th>
<th>Usage Situation Fan</th>
</tr>
</thead>
<tbody>
<tr>
<td>A4</td>
<td>B6 A10</td>
</tr>
<tr>
<td>B2 A5 US4</td>
<td>B7 A11 US8</td>
</tr>
<tr>
<td>A6</td>
<td>B8 A12</td>
</tr>
</tbody>
</table>
Figure Eight
Prime and Relatedness / Amount Manipulation
Brand Prime

Activated Link
Unactivated Link

Brand Fan

A1 → US1
A2 → US2
A3 → US3

Related Fan

A4
A5 → US4
A6

No Fan

B1 → A7 → US5
B4 → A8 → US6
B5 → A9 → US7

Usage Situation Fan

B1 → A10
B7 → A11 → US8
B8 → A12

Usage Situation Prime

Activated Link
Unactivated Link

Brand Fan

A1 ← US1
A2 ← US2
A3 ← US3

Related Fan

A4
A5 ← US1
A6

No Fan

B3 ← A7 ← US1
B4 ← A8 ← US6
B5 ← A9 ← US7

Usage Situation Fan

B6 ← A10
B7 ← A11 ← US1
B8 ← A12

Elizabeth Cowley
A related attribute foil is:

**Brand Fan**

\[ A_{\text{foil}} \]

- A13 US9
- B9 A14 US10
- B9 A15 US11

**Related Fan**

\[ A_{\text{foil}} \]

- A16
- B10 A17 US12
- B10 A18

A unrelated attribute foil is:

**Brand Fan**

\[ B_{\text{other}} \]

- A3
- A13 US9
- B9 A14 US10
- B9 A15 US11

**Related Fan**

\[ B_{\text{other}} \]

- A6
- A16
- B10 A17 US12
- B10 A18

Elizabeth Cowley
Result One
Repeated Measure ANOVA of Brand Recall

Between Subject Effects

<table>
<thead>
<tr>
<th>Source</th>
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<th>F Value</th>
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R-Square | C.V. | Root MSE | SET ONE Mean |
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Dependent Variable: SET ONE

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<td>5.18701607</td>
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<td>GRP*COND</td>
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<td>19.46476965</td>
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<td>0.0233</td>
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Source | DF | Type I SS | Mean Square | F Value | Pr > F |
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Dependent Variable: SET TWO

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<td>0.6546</td>
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Source | DF | Type I SS | Mean Square | F Value | Pr > F |
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Repeated Measures Analysis of Variance
Tests of Hypotheses for Between Subjects Effects

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<th>F Value</th>
<th>Pr &gt; F</th>
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Elizabeth Cowley
### Within Subject Effects

#### General Linear Models Procedure
Repeated Measures Analysis of Variance
Univariate Tests of Hypotheses for Within Subject Effects

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<th>Pr &gt; F</th>
<th>Adj. Pr &gt; F</th>
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<th>F Value</th>
<th>Pr &gt; F</th>
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<table>
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<td></td>
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# Result Two

## Repeated Measure ANOVA of the Ratio of Relevant to Irrelevant Brands

### Between Subject Effects

**Dependent Variable: RATIO1**

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<th>Mean Square</th>
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<th>Pr &gt; F</th>
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<tbody>
<tr>
<td>Model</td>
<td>3</td>
<td>117.4897202</td>
<td>3.92297567</td>
<td>4.11</td>
<td>0.0064</td>
</tr>
<tr>
<td>Error</td>
<td>116</td>
<td>105.48361928</td>
<td>0.90934155</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>119</td>
<td>117.5525630</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R-Square: 0.100372  
C.V.: 66.85372  
Root MSE: 0.9539402  
RATIO1 Mean: 1.42638889

**Source of Variance**

<table>
<thead>
<tr>
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<th>DF</th>
<th>Type I SS</th>
<th>Mean Square</th>
<th>F Value</th>
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<tbody>
<tr>
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<td>COND</td>
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<td>0.89379366</td>
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<td>5.60250001</td>
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**Source of Variance**

<table>
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<td>Error</td>
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<td>Corrected Total</td>
<td>116</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R-Square: 0.142050  
C.V.: 65.12754  
Root MSE: 0.8109975  
RATIO2 Mean: 1.27611111

**Dependent Variable: RATIO2**

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<td>105.48361928</td>
<td>0.90934155</td>
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<tr>
<td>Corrected Total</td>
<td>119</td>
<td>117.5525630</td>
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</tbody>
</table>

R-Square: 0.142050  
C.V.: 65.12754  
Root MSE: 0.8109975  
RATIO2 Mean: 1.27611111

**Source of Variance**

<table>
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<tr>
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**Source of Variance**

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R-Square: 0.142050  
C.V.: 65.12754  
Root MSE: 0.8109975  
RATIO2 Mean: 1.27611111

# Repeated Measures Analysis of Variance

**Tests of Hypotheses for Between Subjects Effects**

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**Tests of Hypotheses for Between Subjects Effects**

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Error: 116  
Root MSE: 0.50972615

Elizabeth Cowley
Result Two (Continued)

Repeated Measure ANOVA of the Ratio of Relevant to Irrelevant Brands

Within Subject Effects

General Linear Models Procedure
Repeated Measures Analysis of Variance
Univariate Tests of Hypotheses for Within Subject Effects

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Elizabeth Cowley
### Result Three

Repeated Measure ANOVA of the Ratio of Relevant to Irrelevant Brands
For the Restate Control Condition

#### Between Subject Effects

**Dependent Variable: RATIO1**

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R-Square  C.V.  Root MSE  RATIO1 Mean
0.032331  64.15608  1.40618090  0.8641275

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**Dependent Variable: RATIO2**

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P-Square  C.V.  Root MSE  RATIO2 Mean
0.176694  68.66192  0.86409621  1.25847953

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### Repeated Measures Analysis of Variance

Tests of Hypotheses for Between Subjects Effects

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Elizabeth Cowley
### Result Three (Continued)

**Repeated Measure ANOVA of the Ratio of Relevant to Irrelevant Brands**

**For the Restate Control Condition**

**Within Subject Effects**

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Elizabeth Cowley
### Result Four

**Repeated Measure ANOVA of the Ratio of Relevant to Irrelevant Brands**

**For the No Usage Situation Until Session Two Control Condition**

#### Between Subject Effects

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#### Source | Root MSE | RATIO1 Mean
mong | 0.9840868 | 1.31830601

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#### Source | Root MSE | RATIO2 Mean
mong | 0.9830547 | 1.43832459

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### Repeated Measures Analysis of Variance

**Tests of Hypotheses for Between Subjects Effects**

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| Error  | 118| 72.83562576 | 0.97325107 |        |        |

Elizabeth Cowley
Repeted Measure ANOVA of the Ratio of Relevant to Irrelevant Brands
For the No Usage Situation Until Session Two Control Condition

Within Subject Effects

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PLEASE FOLLOW THE INSTRUCTIONS PROVIDED IN EACH OF THE FOLLOWING QUESTIONS:

1] Rate yourself as to the amount of knowledge you have about BICYCLES (mark the position you think describes your level of knowledge with an X)

novice ______ ______ ______ ______ ______ ______ expert
0 2 4 6 8 10

2] Rate yourself as to how familiar you are with BICYCLES (mark the position that describes your level of familiarity with an X)

novice ______ ______ ______ ______ ______ ______ expert
0 2 4 6 8 10

3] How often do you ride a bicycle? (mark with an x)

novice ______ ______ ______ ______ ______ ______ expert
0 2 4 6 8 10

4] Do you ride a bicycle as a mode of transportation? ______ (yes or no)

PLEASE TURN THE PAGE

Elizabeth Cowley
CIRCLE ONE OR MORE APPROPRIATE RESPONSES

1] How will the diameter of the wheels affect the performance of the bicycle?
   a] larger diameter, less manoeuvrable
   b] smaller diameter, less effort
   c] larger diameter, faster
   d] smaller diameter, faster

2] How will the tire width affect the performance of the bicycle?
   a] wider tire, more effort
   b] thinner tire, more effort
   c] wider tire, smoother ride
   d] thinner tire, smoother ride

3] How will the tire pressure affect the performance of the bicycle?
   a] more pressure, faster
   b] less pressure, faster
   c] more pressure, less safe
   d] less pressure, less comfort

4] What does the head tube angle effect?
   a] speed
   b] stability
   c] smoothness of ride
   d] none of the above

5] What is meant by a gear ratio?
   a] number of gear wheels on the front compared to the number on the back
   b] number of gear wheels on the front compared to the total number of gear wheels
   c] number of peddle revolutions compared to the number of wheel revolutions
   d] number of wheel revolutions compared to the number of peddle revolutions
   e] none of the above

6] What does the geometry effect?
   a] stability
   b] smoothness
   c] manoeuvrability
   d] response

Elizabeth Cowley
7] What would necessitate bigger chainrings?
   a] smaller wheels
   b] larger wheels
   c] heavier riders
   d] none of the above

8] How many gears do mountain bikes have?
   a] 10
   b] 12
   c] 18
   d] 21
   e] 24

Briefly define the following terms:

rear triangle - ________________________________

______________________________

the q-factor - ________________________________

______________________________

clipless pedal - ________________________________

______________________________

rapid fire shifters - ________________________________

______________________________

a fourth hand - ________________________________

______________________________

Name as many brands of bicycles as you can.

Elizabeth Cowley
Measure Two
Knowledge Measures
Study Two and Three

PLEASE FOLLOW THE INSTRUCTIONS PROVIDED IN EACH OF THE FOLLOWING QUESTIONS:

1) Rate yourself as to the amount of *knowledge* you have about CAMERAS
   (mark the position you think describes your level of knowledge with an X)

   novice ____________________ expert
   0 2 4 6 8 10

2) Rate yourself as to how *familiar* you are with CAMERAS
   (mark the position that describes your level of familiarity with an X)

   novice ____________________ expert
   0 2 4 6 8 10

3) How often do you use a camera?
   (mark with an X)

   never ____________________ often
   0 2 4 6 8 10

4) List as many *real* brand names of cameras as you can.

PLEASE TURN OVER

Elizabeth Cowley
Please circle one or more of the responses:

The format refers to:
   a] the size of the lens
   b] the type of film used
   c] the size of the negative
   d] whether it is automatic or manual

A filmback is:
   a] a piece fixed to the body of the camera
   b] a term referring to the service time for processing
   c] interchangeable on some cameras
   d] the piece of plastic attached to a roll of film

If the exposure control gives the shutter priority, what does not have the priority:
   a] the aperture
   b] the meter weighting
   c] the autofocus
   d] the light sensor

The lower the f-stop the:
   a] the narrower the aperture.
   b] the wider the aperture.
   c] less light is allowed in.
   d] more light is allowed in.

Please define the following terms:

Negative

SLR

ISO speed

DX sensing

Hot shoe

Elizabeth Cowley
Correlation Matrix One
Study One

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 60

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Elizabeth Cowley
## Correlation Matrix Two
### Study Two

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 26

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### Correlation Matrix Three

**Study Three**

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 72

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Elizabeth Cowley
Correlation Matrix Four
Study Three A

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 77

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Elizabeth Cowley
Please read this slowly and carefully.

As with many of the downtown bicycle shops, a large sculpture of old parts of every shape and size is welded to the front of the building. The sculpture is spray painted neon pink which identifies the shop as up-market.

As you push the door open the distinctive smell of new rubber rushes out. The mountain bikes are set to your left. The first bike is an American brand, it has 26" wheels which are a size that is easy to handle. The seat is durable and looks comfortable. The sturdy frame is painted black. The second bike is grey. it looks manoeuvrable and stable. The frame is plain and simple. it comes with a three year guarantee.

There are two hybrid bicycles on display with all of the high tech features and options. The first has a one piece frame and there is an aerobar which diverts the air from the riders' waist. The second has quick release seats and tires. The salesperson is wearing a trendy t-shirt with the brand name of the second one printed on the front. There are cycling shorts and caps displayed above. The gear is more conservative than most accessories you have seen lately.

You notice that tucked in the corner is a row of used bicycles. One of them has been repainted, but you can tell that it is not new. It is significantly less expensive than the other bicycles on display. Another of the used bikes is heavier than the new bikes, it only has one gear. There are saddle bags on the wall behind.

Over to your right the racing bikes are lined up against the wall. The most eye-catching racers are sitting on a display stand at the far end. You notice the seat on the last one is stencilled with a brilliant yellow pattern, and the design on the frame is appealing. Beside it is a bike with the same yellow seat, but the frame is lighter-weight with large wheels and a tiny frame. Both come with ankle straps matching the design on the seat.

Beside the racers is a row of bikes with solid frames. One of the bikes has detachable night lights for the front and back. It is dull green with high quality components. There is reflective material in the pedals for safety. There is another bike that is attractive, it is slightly more fragile looking with sleek lines.

There are so many bicycles to choose from. This choice may be more difficult than you had originally thought.

Elizabeth Cowley
Amateur
Shina brand cameras are simple, automatic cameras which are ideal for beginners. The latest model of Mileo cameras have very basic settings for novices. Davon cameras have an automatic shutterlock which prevents accidental exposures.

Professional
Jonia cameras are medium format which is good for portrait photography. Altex cameras have multiple film backs which is required by professionals. Fiere cameras rewind quietly which is ideal for unobtrusive shots.

Travelling
Quisa cameras have a solid and durable body which is good for travelling. Karic models are compatible with wide angle lens attachments for panoramic shots. Menze cameras can be repaired and generally replaced internationally.

Trendy
Grena models come with contrast filters, the latest trend in colour brightening. Pirra cameras have a trendy, high tech, built-in light meter adjustment. Clibo cameras have a chrome finish that is similar to the newest European brands.

Buffer / Filler Statements
Disposable cameras are now widely available. Camera bags range dramatically in price. Cameras have become more sophisticated lately. Photography has become a very popular hobby these days. The strap of your friend’s camera is black. Older style cameras tend to be manual. Some cameras beep when they perform certain functions. Often the flash and the camera are sold separately.
Stimulus Three
Study Three and Three A Stimulus

At Study:

Related Fan:
(3 of 4)
1 Brand#1 cameras rewind quickly for use during fashion shoots.
2 Brand#1 cameras use the film types required by professionals.
3 Brand#1 cameras produce large negatives used for portraits.
4 Brand#1 cameras offer a professional photographer flexibility.
(3 of 5)
5 Brand#2 cameras are simple cameras suitable for amateurs.
6 Brand#2 cameras prevent accidental exposures when learning.
7 Brand#2 cameras have very basic settings for novices.
8 Brand#2 cameras are equipped with a foolproof focus.
9 Brand#2 cameras have an automatic zoom for beginners.

Unrelated Fan (Brand Fan):
(3 of 4)
10 Brand#3 cameras have durable casings for use when hiking.
11 Brand#3 cameras have tough, solid casings for outdoor use.
12 Brand#3 cameras have a fashionable black leather strap.
13 Brand#3 cameras are more technical than the average brand.
(3 of 5)
14 Brand#4 cameras are the newest brand on the market.
15 Brand#4 cameras are not well-established in the market.
16 Brand#4 cameras are quite heavy and very temperamental.
17 Brand#4 cameras have a setting for close-up photos.
18 Brand#4 cameras are good for photographing details.

Unrelated Fan (Usage Situation Fan):
(3 of 5)
19 Brand#5 cameras attach easily to scuba diving gear.
20 Brand#5 cameras are watertight for use when scuba diving.
21 Brand#6 cameras have a flash that works underwater.
22 Brand#6 cameras sense the light available underwater.
23 Brand#7 cameras automatically control for water temperature.

Elizabeth Cowley
24 Brand#8 cameras have a handbag for use when abroad.
25 Brand#9 is a compact camera convenient for travelling. One or the other
26 Brand#9 cameras stand up to the wear of travelling.
27 Brand#10 cameras can be fixed or replaced internationally.

No Fan:
(1 of each brand)
28 Brand#11 cameras have a sixties look and image about them. One or the other
29 Brand#11 cameras have an old fashioned image about them.
30 Brand#12 cameras have filters to brighten the colours. One or the other
31 Brand#12 cameras perform best when using colour film.
32 Brand#13 cameras come with wide angle lens attachments. One or the other
33 Brand#13 cameras have a variety of lens accessories.
34 Brand#14 cameras come in many different colours and designs.
35 Brand#15 cameras are quite light and very fragile.
36 Brand#16 cameras have become very sophisticated lately.

Recognition Only

37 Brand#1 cameras are simple cameras suitable for amateurs.
38 Brand#1 cameras have an automatic zoom for beginners.
39 Brand#2 cameras rewind quickly for use during fashion shoots.
40 Brand#3 cameras are quite heavy and very temperamental.
41 Brand#3 cameras have a setting for close-up photos.
42 Brand#4 cameras have durable casings for use when hiking.
43 Brand#7 cameras have a handbag for use when travelling.
44 Brand#8 cameras have a flash that works underwater.
45 Brand#10 cameras sense the light available underwater.

46 Brand#14 cameras have become very sophisticated lately.
47 Brand#15 cameras come in many different colours and designs.
48 Brand#16 cameras are quite light and very fragile.

Brands:

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<tr>
<th>Brand#1</th>
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<th>Brand#3</th>
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Elizabeth Cowley
APPENDIX G
INSTRUCTIONS
No Usage Situation at Encoding Condition

In a moment you will be reading a story about going to a bicycle shop. Please read the story slowly and carefully.

Usage Situation at Encoding Condition

In a moment you will be reading a story about going to a bicycle shop. Please try and imagine (insert usage situation). Please read the story slowly and carefully.
Instructions Two
Recall Instructions for Study One

RECALL SESSION ONE

No Usage Situation at Encoding Condition

Please think back to the story you read at the beginning of the session and try and imagine (insert usage situation). Please write the reason for going to the store at the top of the page and list as many of the bicycles as possible.

Usage Situation at Encoding Condition

Please think back to the story you read at the beginning of the session. Please write the reason for going to the store at the top of the page and list as many of the bicycles as possible.

RECALL SESSION TWO

Once again, please think back to the story you read at the beginning of the session and try and imagine (insert usage situation). Please write the reason for going to the store at the top of the page and list as many of the bicycles as possible.

Elizabeth Cowley
Instructions Three
Encoding Instructions for Study Three

SESSION ONE

You will be seeing a series of statements on the screen. The statements are about cameras. Each camera brand will be seen with an attribute.

You will NOT recognize the brand names, they are being tested for a new product. When the statements appear on the screen, read them and decide how well the brand name suits the attribute. A second or two after the statement is seen a scale and a blue box will appear at the bottom of the screen. Please type the number which best represents the appropriateness of the brand name given the attribute.

The number you entered will appear in the blue box. You will be asked if you want to change the rating. If it is okay, press enter. If you want to change it, enter the new number and press enter. Please use the entire scale. you are not limited to the endpoints.

PLEASE TAKE YOUR TIME. REALLY THINK ABOUT THE STATEMENTS. THANKS.
Instructions Three (continued)

Encoding Instructions for Study Three

Here is an example of the statements:

Stanz cameras come with a tripod for stability.

... does the word Stanz suit the attribute?

If the brand is not at all appropriate, you might use 7, 8 or 9.
If the brand is very appropriate, you might use 1, 2 or 3.
If you are not really of any opinion, you might use 4, 5 or 6.

Please take your time. there is no need to hurry at this point.
Instructions Four
Recognition Instructions for Study Three

In a moment you will see statements about cameras appear on this screen. Some of the statements are from the first session, some are not. Your task is to read the statement on the screen, decide if you think it was from the first session, and then indicate your response. If you think it was from the first session, hit the key marked "Yes". If you do not think the statement was from the first session, hit the key marked "No".

Please respond as quickly as you can without making errors.

Please respond to all questions even if you have to guess.

After you press the "yes" key or the "no" key, you will be asked to press enter when you are ready for the next statement to appear.

Let's practice the task on the instructions. When the statements appear on the screen, read them and indicate whether the sentence was part of the instructions you just read.
Instructions Four (continued)
Recognition Instructions for Study Three

... Okay, the practice session is over.

Please remember to keep looking at the screen. Try to keep your eyes fixed on the middle of the screen. Put one finger on each of the answer keys. Yes and No. Press the enter key only when you are ready to see the next statement. Try to answer as QUICKLY as you can without errors.

Sometimes only part of the statement will appear at first. Please start reading what is on the screen ... even though it may seem strange at the beginning.

Please press enter when you are ready to begin.