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Although diffusion models have been successfully used to predict the adoption patterns of new products and technologies, little research has examined the psychological processes underlying the individual consumer's adoption decision. This research uses the knowledge transfer paradigm, studied often in the context of analogies, to demonstrate that both existing knowledge and innovation continuity are major factors influencing the consumer's adoption process. In two experiments, the authors demonstrate that the relationship between expertise and adoption is relatively complex. Specifically, their findings indicate that, compared with novices, experts report higher comprehension, more net benefits, and therefore higher preferences for continuous innovations. However, for discontinuous innovations, experts' entrenched knowledge is related to lower comprehension, fewer perceived net benefits, and lower preferences compared with that of novices. Only when this entrenched knowledge is accompanied by relevant information from a supplementary knowledge base are experts able to understand and appreciate discontinuous innovations. These findings have implications for segmentation, media planning, and the creation of product/brand loyalty.

Entrenched Knowledge Structures and Consumer Response to New Products

The innovation–diffusion literature in marketing has provided numerous insights into the aggregate adoption patterns of new technologies. Diffusion models have been successfully used to forecast sales, to direct pricing and advertising strategies, and to time launches of successive generations of new products (Gatignon and Robertson 1985; Mahajan, Muller, and Bass 1995). Relatively little research, however, has examined the processes underlying adoption decisions—specifically, how individual consumers learn about and develop preferences for new products (for two exceptions, see Olshavsky and Spreng 1996; Ross and Robertson 1990). As the strategic and financial importance of launching new products increases, a better understanding of the consumer's adoption process and the factors affecting it can lead to more effective segmentation, positioning, and launch strategies.

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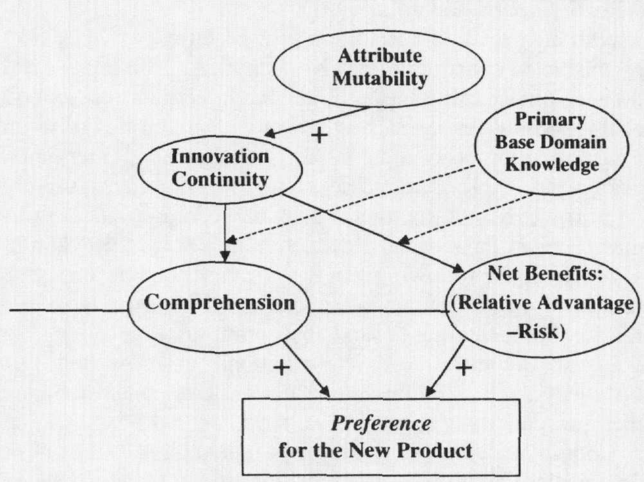
A central factor that influences the adoption process is consumers' existing product category knowledge. Results from both consumer behavior and psychology indicate that prior knowledge influences both the cost and the content of thinking (e.g., Alba and Hutchinson 1987; Bettman, Johnson, and Payne 1991; Gregan-Paxton and John 1997). Similarly, the diffusion literature suggests that both the cost and the content of thinking, in turn, influence diffusion speed and success (e.g., Gatignon and Robertson 1985; Ostlund 1973; Robertson 1971; Rogers 1983).

Drawing on Rogers's (1983) scheme for classifying innovations, we link these streams of literature by proposing that prior knowledge influences (1) consumers' comprehension of a new product[1] (i.e., its complexity; see Gatignon and Robertson 1991, p. 324) and (2) consumers' perceptions of the product's relative advantages and risks.[2] The effects of these constructs on adoption are well established. Ceteris paribus, the likelihood of adoption is greater (1) the higher

[1]Gatignon and Robertson (1991, p. 324) suggest that both compatibility and complexity "are mainly related to consumer learning requirements." In this research, we assume that compatibility is evidenced in complexity, such that a more incompatible innovation results in higher perceived levels of complexity. We discuss this further and in more detail in the article. Furthermore, we assume that consumers' initial comprehension level is inversely related to their perceived learning requirements.

[2]The work by Bauer (1960) and Ostlund (1973) contributes risk as a factor influencing adoption.

Figure 1
FACTORS INFLUENCING THE FORMATION OF PREFERENCES



consumers' comprehension (Gatignon and Robertson 1991; Holak 1988; Rogers 1983; Sheth 1981), (2) the fewer the risks (Bauer 1960; Ostlund 1973; Ram and Sheth 1989), and (3) the greater the relative advantages (Rogers 1983).[3] Although these results have been found consistently in the diffusion literature, little research has examined the determinants of these factors. Here, we focus on a key determinant, prior knowledge, and examine its influence on consumers' perceptions of both continuous and discontinuous innovations.

CONCEPTUAL FRAMEWORK

The proposed model is presented in Figure 1. In this section, we explain the model and make specific predictions about how existing knowledge influences the new product adoption process.

Attribute Mutability and Innovation Continuity

Innovations typically result from a change to or the elimination of product attributes or features within an existing category (Goldenberg, Mazursky, and Solomon 1999). Even the designs for discontinuous innovations, or so-called really new products, are often derived from one or more existing product categories. Ward (1995) refers to this phenomenon as "structured imagination" and suggests that when people use their imaginations to develop new ideas, the resulting ideas strongly reflect the structure and the properties of existing categories. For example, the earliest designs for railway passenger cars were drawn from the stagecoach, which was the predominant long-distance passenger vehicle of the time (Ward 1995, p. 159). Although railway cars eliminated a critical feature of the stagecoach category (i.e., the horse), they were still characterized by several features common to the stagecoach: outside brakes, outside running boards, conductors' seats 12 feet high outside the car, and no central aisles inside (Ward 1995; White 1978). The designers of the early railway cars were considered highly creative people, yet their discontinuous innovation was still structured and constrained by their knowledge of the stagecoach. Earlier products are often used as design templates for innovations because the existing product is a viable solution to several potential functional and aesthetic goals (Klein 1987).

Similarly, consumers' ability to understand and represent an innovation is structured and/or constrained by their existing category knowledge. The ease with which consumers can transform their existing category structures to accommodate the discrepant information presented by an innovation will largely determine how continuous they perceive the new product to be. The notion of mutability, which is the conceptual transformability of different features or attributes in a category schema, is useful in this context (Love 1996; Love and Sloman 1995; Sloman, Love, and Ahn 1998). The mutability of a feature depends on (1) the variability of that feature across category members and (2) the number of other features in the category that depend on the feature (Love and Sloman 1995). In the context of learning about innovative products, the more immutable the feature change, the greater is the difficulty consumers will have in incorporating the new product into the existing category structure. Thus, as the immutability of the changed feature increases, the perceived discontinuity of the innovation will also increase.

The Primary Base Domain

This discussion assumes that the continuity of an innovation is assessed with respect to some existing product category. We call this existing product category the *primary base domain* and define it as the category most similar to the innovation in terms of the benefits provided. Knowledge in the primary base domain is expected to have the most significant influence on consumers' perceptions of an innovation's continuity.[4]

[3]Rogers (1983) also includes two additional dimensions in his scheme for evaluating innovations: trialability and observability. Trialability, or divisibility, refers to the consumers' ability to try the product on a limited basis before making the adoptions decision. Observability, or communicability, refers to consumers' ability to learn about the product's benefits and weaknesses from the social environment before making the adoption decision. Although both of these factors can influence consumers' preferences for a new product, this research does not include these two dimensions in the model for two reasons. First, the influence of both trialability and observability on preferences is logically mediated by risk and relative advantage. A major purpose of trying out a product before purchase is to mitigate the number of perceived risks and establish the existence of relative advantages. Similarly, observability reflects a consumer's ability to learn about the relative advantages and risks before purchase. By including relative risk and relative advantage in the model, the indirect influence of trialability and observability is captured. Second, consistent with the first reason, prior empirical research has established that these two factors do not significantly predict adoption when other innovation characteristics are in the model (Holak 1988; LaBay and Kinnear 1981; Tornatzky and Klein 1982).

[4]Definitions of prior knowledge and expertise vary considerably in the literature. We distinguish among three types of knowledge in this research: (1) objective knowledge (accurate product category information stored in memory), (2) subjective (self-assessed) knowledge, and (3) product-related experience (familiarity). Although the three constructs are often correlated, each can influence information processing in different ways (Alba and Hutchinson 1987; Brucks 1985; Johnson and Russo 1984; Mitchell and Dacin 1996; Park and Lessig 1981; Park, Mothersbaugh, and Feick 1994). Of these knowledge types, objective knowledge is most closely related to consumers' product category representations, because this type of knowledge includes the number of features, attributes, and relations among features stored in a person's category schema. Therefore, this research focuses on the influence of objective knowledge on the formation of consumers' preferences.

In the previous example, stagecoach knowledge would be considered the primary base domain relative to the railway car because of the similarity in the benefits provided. The mutability of the feature "horse" would then serve as the basis for assessing the continuity of the railway car innovation, because it is the feature eliminated from the stagecoach category in creating the railway car. Thus, the more immutable the feature changed in the primary base domain, the greater are consumers' perceptions of the innovation's discontinuity.

Knowledge Transfer from the Primary Base Domain

Knowledge in the primary base domain is used to learn about and develop a representation of the new product. The knowledge transfer paradigm, used often in studies of analogical learning, provides a strong theoretical basis for describing how primary base domain knowledge influences a person's adoption process.

By transferring existing knowledge from a familiar domain (the base) to a new product (the target), consumers can learn about a new product. Research in knowledge transfer and analogical reasoning suggests that this learning occurs through a series of stages: access, mapping, and transfer (Gentner 1989; Holyoak and Thagard 1989; for a complete review, see Gregan-Paxton and Roedder John 1997). In the access stage, a potentially relevant base domain becomes active in a person's memory and thus can serve as a source of information about the target. When the target shares several surface similarities (i.e., visible attributes) with a base domain, access is likely to occur spontaneously (Gentner, Rattermann, and Forbus 1993). For example, if a consumer sees an advertisement for a digital camera (the target), existing knowledge of film-based cameras (the base) is likely to be accessed simply because the digital camera looks a lot like a film-based camera. However, access can also be externally cued by sources such as marketing communications (Moreau, Markman, and Lehmann 2001).

When a domain has been accessed, consumers can compare the content and structure of the base with the target domain. In this comparison, the goal is to map elements from the base domain to elements in the target domain. These mappings then serve as paths on which additional knowledge can transfer from the base to the target (Gregan-Paxton and Roedder John 1997, p. 270). The similarity, or compatibility in Rogers's (1983) terminology, between the two domains (the base and the target) dictates the ease with which these mappings can be constructed. In turn, the types of mappings constructed will influence the type and amount of knowledge that will transfer, the inferences that can be made about the product, and the extent to which consumers comprehend the new product.

In the mapping stage of the knowledge transfer process, consumers align the base and target domains on the basis of the similarities of either attributes or relations (Clement and Gentner 1991; Gregan-Paxton and Roedder John 1997; Spellman and Holyoak 1992). For example, consumers using the camera base domain to understand a new digital camera can map either the attribute "button" or the relation "button opens shutter" from the base to the target. Recent research has demonstrated that people prefer relation-based mappings to attribute-based ones (Clement and Gentner 1991; Gentner, Ratterman, and Forbus 1993), because relational mappings enable consumers to create goal-relevant inferences about how the new product will perform (Gregan-Paxton and John 1997).

Although relational mappings are preferred, novices may be unable to construct them (Novick 1988). The representations of novices simply may not contain enough relations to enable the novices to recognize relational similarities between a base and a target (Gentner 1983, 1989; Gentner, Rattermann, and Forbus 1993). Thus, novices tend to rely more exclusively on attribute-based alignments such as visible product attributes (Gregan-Paxton and Roedder John 1997; McKeithen et al. 1981). In the following sections, we describe how expertise in a primary base domain influences internal knowledge transfer for both continuous and discontinuous innovations. In doing so, we make specific predictions regarding how this knowledge transfer affects consumers' comprehension and their perceptions of relative advantages and risks.

Comprehension. For continuous innovations, only minor disruptions occur in the relationships among the attributes in the primary base domain. An expert in the primary base domain should be able to construct relation-based mappings between the base and the target domains easily and thus transfer a significant amount of useful attribute- and relation-based knowledge. In this situation, expertise (and thus comprehension) in the base domain translates into expertise in the target domain.

In contrast, a novice is unlikely to recognize the relational similarities between the two domains and may be forced to rely on similarities between the product attributes presented in the advertisement (or other marketing communication) for constructing mappings. At best, the knowledge transferred as a result of these attribute-based mappings would provide only attribute-based information about the target. At worst, novices may be unable to construct the attribute-based mappings at all. Novices have fewer attributes and less attribute information stored in their base domains than do experts. If a new product advertises attributes that novices do not already have stored in their existing base domains, they will have difficulty mapping the new target back to their (impoverished) base domains. Thus, novices' comprehension of the new product is likely to be significantly lower than that of experts. These predictions are consistent with research in both consumer behavior and psychology, which consistently demonstrates that expert consumers face lower learning costs than novices in understanding a novel item in an existing category (Alba and Hutchinson 1987; Einhorn and Hogarth 1981; Johnson and Kieras 1983; Newell and Rosenbloom 1989). Therefore,

> H_1: For continuous innovations, expertise in the primary base domain will be positively related to comprehension.

Discontinuous innovations, however, involve the change to an immutable feature within the primary base domain. By definition, a number of relations among the features in that category will be disrupted. Experts, who prefer relation-based mappings, are more likely than novices to recognize the relation-based dissimilarities between the base and the target as they attempt to map the two domains (Gentner, Rattermann, and Forbus 1993). Novices, who rely more on visible attribute-based mappings, may not recognize as many dissimilarities as experts when constructing their mappings.

For example, the digital camera eliminates an immutable feature (film) within the primary base domain, cameras. Because the digital and film-based cameras still share several surface-level attributes (e.g., lens, viewfinder, size, shape), camera novices can still construct mappings between the attributes and transfer some of their limited base domain knowledge to the target. Experts, however, will recognize that several relations in the camera domain do not map onto the digital camera domain (e.g., light no longer exposes film, chemicals and darkrooms are no longer needed to process and print pictures). Experts will have difficulty in constructing a number of relation-based mappings between the base and the target. Recognizing the discrepancies between the two domains, they may be unsure of what knowledge can be transferred to the target. Experts, in this situation, are better able than novices to recognize what they do not understand. Ironically, the same dense, deep, and highly-interconnected knowledge structures that increased experts' comprehension of continuous innovations will decrease their perceived comprehension of discontinuous innovations. Therefore,

> H_2: For discontinuous innovations, expertise in the primary base domain will be negatively related to comprehension.

Net benefits (relative advantages–risks). Relation-based mappings are preferred to attribute-based mappings in the knowledge transfer process because they allow for the generation of goal-related inferences (Gregan-Paxton and Roedder John 1997) and therefore enable consumers to evaluate new products more effectively. Perceptions of relative advantage and risk are based on inferences about how the new product will or will not satisfy specific goals (Huffman and Houston 1993). If the product is perceived as satisfying a positive goal or failing to satisfy a negative goal, it possesses a relative advantage; conversely, if the product is perceived as satisfying a negative goal or failing to satisfy a positive goal, it possesses a risk.

For a continuous innovation, experts are likely to be better able than novices to construct relation-based mappings, and this differential ability should lead to differences in perceptions of relative advantage and risk. More specifically, when interpreting an advertisement for a superior new product, experts should be in a better position than novices to understand the advantages of truly innovative improvements.[5] For example, a camera expert who encounters a new film-based camera with a faster shutter speed can quickly understand the relationship between that new feature and film exposure and can then interpret it as a relative advantage. A novice, who does not understand how shutter speed influences exposure, cannot transfer sufficient knowledge to recognize the advantage of this improvement. Furthermore, the novice may view the advertised new feature as a further complicating variable and thus may perceive it as a risk. Therefore,

> H_3: For a continuous innovation, expertise in the primary base domain will be positively related to perceived net benefits (i.e., relative advantages–risks).

For discontinuous innovations, however, experts' difficulty in mapping relations between the base and the target domains should also influence their perceptions of a new product's relative advantages and risks. Experts are likely to have more product-related goals than novices do in the base domain. However, because they cannot effectively map the base to the target domain, they cannot transfer the knowledge necessary to make goal-relevant inferences effectively. For example, camera experts who want to take action shots (i.e., a base domain goal) know that with a traditional camera they can get high-quality pictures using high-speed film and short exposures (i.e., the relations among the features). The same photographers may still have the same goal when evaluating a digital camera, but the relations among the features of the primary base domain will not transfer to the target to indicate how this goal would be achieved. Experts in the primary base domain are more likely to have more unresolved goals than novices, and these unresolved goals will be encoded as risks because the experts are unable to predict whether the new product can favorably satisfy them. Therefore,

> H_4: For a discontinuous innovation, expertise in the primary base domain will be negatively related to perceived net benefits (i.e., relative advantages–risks).

Supplementary Base Domain Knowledge

Because many discontinuous innovations do not fit neatly into any existing product category, knowledge from additional domains may also influence the adoption process for these new products. Information in these additional domains may be used to supplement a consumer's initial representation of a new product. However, the influence of this supplementary knowledge on the adoption process is fundamentally different from that of knowledge in the primary domain.

The primary base domain serves as the basis for analogy, enabling consumers to develop a basic structure for the target domain. The relevant operations for using the primary base domain are mapping relations and carrying the relational structure from base to target. When this relational structure is established, a supplementary base domain can be used to help in causal reasoning about the target (Gentner and Stevens 1983; Markman 1999, Ch. 9). This process of causal reasoning may involve analogy or other inferential processes. For example, a consumer encountering a digital camera for the first time will begin by comparing the digital camera to film-based cameras (the primary base domain). This process of analogy enables the transfer of relations from film-based cameras to digital cameras. However, the new representation is likely to have gaps. These gaps may be filled by reasoning from a supplementary base domain. In the case of a digital camera, the analogy to film-based cameras does not provide information about how images are processed. However, consumers can use their knowledge of computers, graphics software, and printing to understand how images may be processed.

Comprehension. Because supplementary knowledge may augment a consumer's representation of a discontinuous innovation, it is important to look for the effects of supplementary knowledge on consumers' comprehension of innovations. Although this topic has not been explored extensively, it seems safe to assume that knowledge in the supplementary base domain will have a positive influence

[5]Here, we assume that the advertised product is objectively superior to other products in the existing base domain. If the product were not objectively superior, experts would also be in a better position than novices to assess its potential inferiority. Consequently, experts would perceive fewer relative advantages and more risks than would novices.

on comprehension. However, the particular influence of supplementary knowledge will depend on its relationship with the primary base domain.

In some cases, supplementary knowledge will be used to complement the consumer's representation of a new product in areas in which information from the primary base domain does not apply. In this situation, the influence of the two knowledge bases on a consumer's comprehension will be an additive one. For example, no amount of knowledge about traditional cameras can be used to understand how a digital camera's images are manipulated by software applications. In this case, supplementary knowledge from the computer domain can be brought to bear.

In other cases, however, supplementary knowledge will act in conjunction with information that has been transferred from the primary domain. Here, the supplementary knowledge and the knowledge transferred from the primary base domain must work together to enhance comprehension. For example, if a camera expert were concerned about how to change the exposure of the image, knowledge of computer hardware could be used to reason about the limitations of the optical sensors that create the digital images. In this case, however, the supplementary knowledge is useful only to camera experts, who already know about the relationship between shutter speed and film. A novice, who does not have this knowledge about the primary base domain, would not even think of this aspect of the digital camera. As this example suggests, there will be cases in which expertise in the primary base domain is a prerequisite for using supplementary knowledge, making the relationship between primary and supplementary knowledge an interactive one.

Net benefits. Knowledge in a supplementary base may not only influence consumers' comprehension of a new product but also affect consumers' goals. When consumers have a better understanding of what a new product can or cannot do, their perceptions of its relative advantages and risks are likely to change. Because knowledge from multiple supplementary domains may influence these perceptions differently, it would be premature to place a valence on the influence of supplementary knowledge on perceived net benefits.

STUDY 1

Study 1 is designed to test H_1–H_4. In doing so, it will also enable both a test of the model proposed in Figure 1 and an examination of the influence of supplementary knowledge on the adoption process.

Design and Procedure

In Study 1, one factor was manipulated between subjects (innovation continuity), and two other factors were measured (knowledge in a primary and a supplementary base domain). Dependent measures included both verbal protocols and scale items, the latter of which were designed to measure consumers' comprehension and their perceptions of relative advantage and risk relative to their goals. In addition, subjects' preferences for the product were measured.

We recruited 58 student subjects for a marketing research study and paid each $15 for his or her participation. The experimental sessions were run individually with the same experimenter, and each session lasted between 30 and 45 minutes. As a cover story, we told subjects that a marketing research firm had several clients that were interested in respondents' reactions to their products. We told subjects to imagine that they were in the market for the product and then read them the following script (Ericsson and Simon 1984):

> The sponsoring companies are interested in everything that goes on in your mind when you see their products. To do this, I will ask you to talk out loud while you're looking at each ad, and I'll record your thoughts on this tape recorder. The important thing to do is to talk out loud constantly from the minute I present the ad. I want to get everything you happened to think of, no matter how irrelevant it may seem. Don't plan what to say, just let your thoughts speak.

We then gave subjects a practice advertisement to familiarize them with the protocol process. After having an opportunity to ask questions, subjects saw the test advertisement. Subjects' protocols were tape-recorded. After viewing the test advertisement, subjects responded to the dependent scale measures and the knowledge measures for both base domains.

Experimental Stimuli

We used a series of brainstorming sessions to develop a set of new products that had evolved from the elimination of a critical and potentially immutable feature from the primary base domain. From this list, we selected one product on the basis of its potential relevance and relative unfamiliarity to the subjects: digital cameras. Camera knowledge is considered the primary base domain for the digital cameras, and film is the critical feature eliminated. To obtain mutability ratings for the common features of cameras, we followed the three-phase methodology established by Love and Sloman (1995).

Phase 1. Thirty student subjects were given 90 seconds to list all the features associated with the category "cameras." The responses were tallied, and features listed by fewer than one-third of the subjects were discarded (Love and Sloman 1995; Rosch et al. 1976). The remaining items constituted the list of common features for cameras.

Phase 2. A new set of student subjects provided variability ratings for each of the common features in the camera category (n = 60). For each feature, subjects were asked, "What percentage of cameras have a ___________?" Features perceived to be present in most of the category members are defined as immutable, because exceptions are rare (Love and Sloman 1995, p. 655).[6] Film was rated as the least variable feature (mean = 91%), and paired t-tests revealed that film was perceived as significantly less variable than each of the other features (all $p < .001$), with the exception of lens (mean = 88%, $p > .10$).

Phase 3. A set of new student subjects then rated perceived dependency among the features in the camera category (n = 40). Subjects were shown all the common features for the category simultaneously. Each feature was inscribed in a circle, and subjects drew arrows from each feature to each other feature on which they believed the feature

[6]Note that features present in half of the category members have the highest variability. Both rare and commonly included features have low variability. However, in the first stage, rare features were eliminated from the common set of features. Therefore, the range of variability in this task covers only the linear upper half of the inverted U.

depended (Love and Sloman 1995). Features with fewer incoming arrows are considered more mutable. The results showed that film had the most features depending on it (mean = 2.57), significantly more than other features ($p < .05$ for all paired t-tests). Taken together, the results suggest that film is the most immutable feature in the camera category.[7]

Mutability as a predictor of continuity. As depicted in Figure 1, we propose that innovations resulting from the change to an immutable feature will be perceived as more discontinuous than ones resulting from the change to a mutable feature. To test this prediction, we asked 120 new student subjects to provide continuity ratings for one of the two new hypothetical products: one involving a change to the target immutable feature (a digital camera) and the other involving a change to the target mutable feature (a film-based camera with new flash technology).

Advertisements for each camera were constructed to be as similar to each other as possible (see the Appendix). The digital and film-based camera shared the same advertisement layout and used the same headline, "How to load a camera." Each camera advertisement consisted of a scanned photograph of a real camera with brand markings removed. Five features described each camera, and lines pointed to their locations on the camera. The bottom of each advertisement contained a subheadline that read, "Introducing the DX-250 that's loaded with features" (and in the digital camera, "not film"). Following the subheadline, two lines (22 and 24 words, respectively) of body copy described each camera.[8]

Based on Olshavsky and Spreng's (1996) and Robertson's (1971) studies, subjects were asked to rate the innovation on a three-item scale: (1) how different the innovation was from other products they currently knew about, (2) how innovative they perceived the product to be, and (3) to what extent the innovation would change the way they would use the product or service.[9] Coefficient alpha for these three measures was .87.

The results revealed that the digital camera was rated as significantly more different (4.6 versus 3.1, $p < .01$) and more innovative (4.9 versus 2.2, $p < .01$) and as leading to more significant change in use (5.1 versus 3.0, $p < .001$) than the film-based camera with the new flash speed. These findings support our proposition and suggest that changing an immutable feature leads to higher perceptions of innovation discontinuity than changing a mutable feature.

[7]We recognize that in some cases, prior knowledge could influence perceptions of mutability. We tested for this possibility and found no evidence of such an effect in this sample.

[8]Pretests were conducted to ensure that the advertisement manipulations did not systematically affect any perceptions other than those of innovation continuity. Forty subjects participated in the pretest and were randomly assigned to either the continuous or discontinuous condition. After studying the advertisement for 60 seconds, subjects were asked for their evaluation of the advertisement, their attitude toward the advertisement, the realism/believability of the advertisement, the amount of information provided by the advertisement, the perceived effectiveness of the advertisement, and the realism of the camera depicted. No significant differences emerged between the two advertisements.

[9]Questions were measured on seven-point scales, where higher scores reflected higher perceptions of innovativeness.

Knowledge Measures

A 14-item true/false test was used to assess subjects' objective knowledge of cameras (Barnes 1997), and a 13-item test was used to assess objective knowledge of computers (Johar, Jedidi, and Jacoby 1997). Coefficient alphas for these objective knowledge tests were .70 and .67, respectively.

Dependent Measures

Two independent judges, both of whom were doctoral students in marketing and were blind to the purpose of the experiment, used a coding scheme created by the experimenter to code the statements in subjects' verbal protocols into three different categories: comprehension and product-related goals valenced as either relative advantages or risks.[10] The experimenter served as a third coder. The average interrater reliability among the three judges was .71. Disputes were resolved by taking the category value assigned to a statement by two of the three coders.

Measures of comprehension were derived from a combination of subjects' verbal protocols and their responses to a scale item. The protocol measures included the number of responses falling into the following categories: statements reflecting difficulty in understanding specific features of the product (e.g., "I don't know how good a 1/8000 of a second shutter speed is"), statements reflecting difficulty in understanding the product in general, statements reflecting surprise at unexpected features, and questions asked about the product or its features (e.g., "What is shutter priority?"). The scale item asked subjects to assess their difficulty in understanding the product. To create the overall measure of comprehension, we standardized, summed, and then reversed each type of protocol statement and the scale measure to obtain the correct valence on the variable. Alpha for the measures was .71.

Goals were measured by means of subjects' protocols. Subjects' goal-relevant statements were coded as either relative advantages (when the product achieved a positive goal or did not achieve a negative goal) or risks (when the product achieved a negative goal or did not achieve a positive goal). For example, a positive goal might be "to take clearer pictures," whereas a negative goal might be "to be difficult to operate." Finally, preferences for the new product were measured on five-item scales that captured subjects' evaluations, attitudes, and purchase intentions (alpha = .85).

Results

Comprehension. H_1 and H_2 predict that innovation continuity will interact with consumers' camera knowledge to influence their comprehension. Specifically, these hypotheses predict that camera experts' comprehension of the continuous innovation (the film-based camera) will be greater than that of camera novices, and their comprehension of the discontinuous innovation (the digital camera) will be lower than that of novices.

Regression was used to test these hypotheses (Table 1). Innovation continuity is included in the model as a dummy

[10]The coding scheme was designed to capture consumers' evaluative comments and their comprehension-related comments. After reviewing a subset of 15 typed protocols, we developed categories that captured the range of subjects' evaluative thoughts and their comprehension.

Table 1

PREDICTORS OF COMPREHENSION, NET BENEFITS, AND PREFERENCES FOR CAMERAS

	Innovation Continuity and Prior Knowledge					Proposed Mediators		
Dependent Variable	*Innovation Continuity*	*Camera Knowledge*	*Computer Knowledge*	*Camera Knowledge × Innovation Continuity*	*Computer Knowledge × Innovation Continuity*	*Compre-hension*	*Net Benefits*	R^2
Comprehension	.25*	.26		–.39**	.40***			.22
Traditional cameras only		.27*						.07
Digital cameras only		–.24*	.52***					.28
Net Benefits	–.01	.33**		–.47**	–.17			.12
Traditional cameras only		.31*						.10
Digital cameras only		–.27*	–.22					.14
Preferences								
Knowledge/continuity model	–.03	.09		–.38**	–.34			.13
Proposed mediators model						.22*	.41***	.28
Overall model	–.08	–.07		–.13	–.23	.33**	.31**	.36

*$p < .10$.
**$p < .05$.
***$p < .01$.

variable, and the discontinuous innovation (the digital camera) is coded as 1. Camera knowledge is included in the model as subjects' overall camera score. Other independent variables are the predicted interaction between innovation continuity and camera knowledge and an interaction term for innovation continuity and computer knowledge as a control.

Although the main effects of innovation continuity and camera knowledge were not significant, the interaction between innovation continuity and camera knowledge, predicted in H_1 and H_2, was significant (B = –.39, $p = .05$). For the continuous innovation, the relationship between camera knowledge and comprehension was positive (B = .27, $p < .10$). For the discontinuous innovation, however, the relationship between camera knowledge and comprehension was negative (B = –.24, $p < .10$). For a further illustration of these results, camera knowledge was dichotomized, and the resulting means are graphed in Figure 2, Panel A.

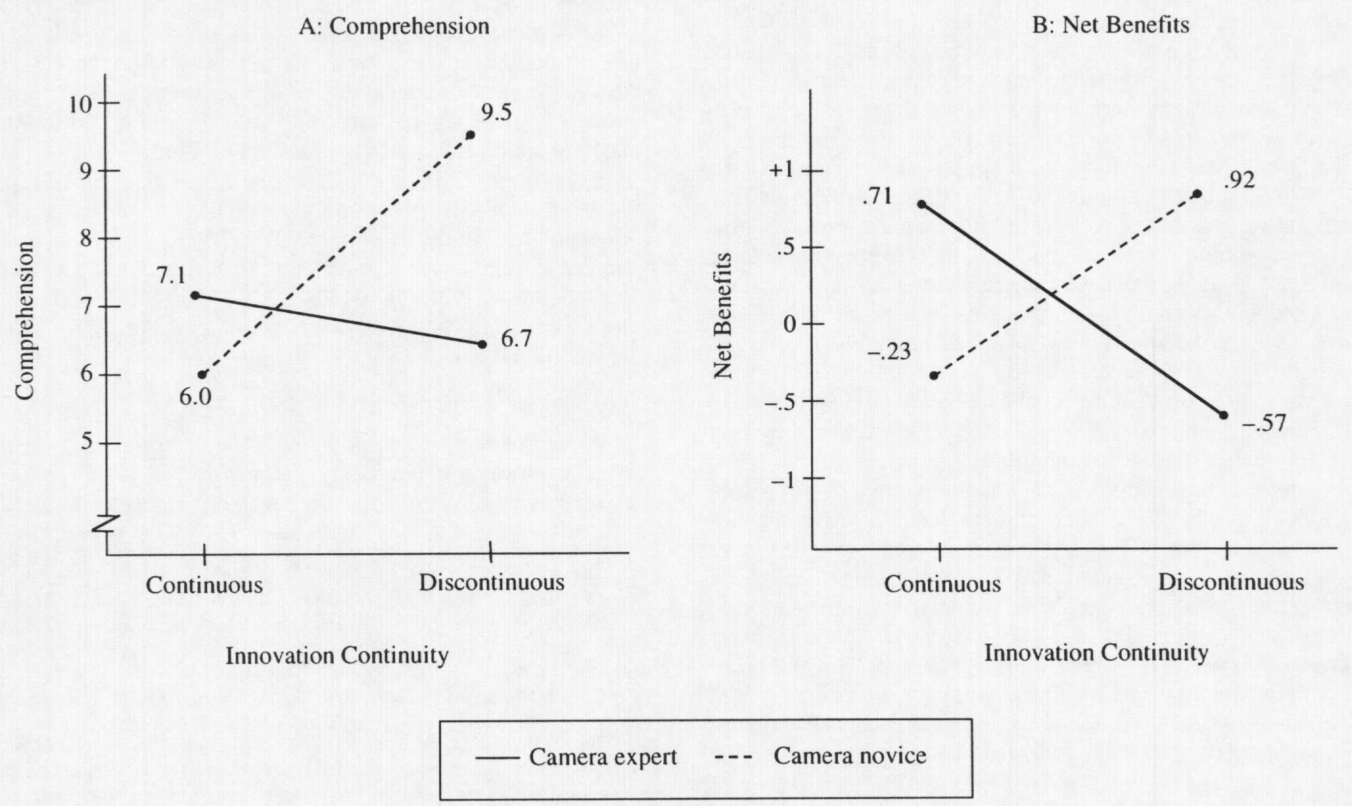
The interaction between innovation continuity and computer knowledge was also significant (B = .40, $p < .01$). Computer knowledge was positively related to comprehension of the digital camera (B = .52, $p < .01$) but not significantly related to comprehension of the film-based camera. However, computer knowledge did not interact with camera knowledge to influence comprehension of a digital camera. This finding suggests that subjects' supplementary computer knowledge was used to complement their representations of the new product, providing information about the digital camera that their film-based camera knowledge was unable to address. In this case, the relationship between primary base knowledge and supplementary base knowledge appeared additive in nature.

Net benefits. Again, a regression model was used to test H_3 and H_4. The independent variables in this model were the same as those used to predict comprehension. As in the comprehension model, the predicted interaction between innovation continuity and camera knowledge was significant (B = –.47, $p < .05$). Again, separate regression models were run for each type of camera. For the continuous innovation, the relationship between camera knowledge and perceived net benefits was positive (B = .31, $p < .10$). For the discontinuous innovation, however, the relationship between camera knowledge and perceived net benefits was negative (B = –.27, $p < .10$). The means are shown in Figure 2, Panel B. Computer knowledge did not have a significant influence on the perceived net benefits subjects ascribed to the digital camera.

Preferences. To determine whether the results from this study were consistent with the general results in the diffusion literature, we ran a set of additional regression models (Table 1). Using camera preferences as the dependent variable, we designed three models to test the conceptual model proposed in Figure 1. The first model (Model A) included as independent variables innovation continuity, subjects' prior knowledge, and interactions among these factors. The second model (Model B) included the two proposed medi-

Figure 2

THE INFLUENCE OF INNOVATION CONTINUITY AND CAMERA KNOWLEDGE ON COMPREHENSION AND PERCEIVED NET BENEFITS (STUDY 1)



ators—comprehension and perceived net benefits—as predictors of preferences, and the third model included all the variables to test for mediation.

Model A explains 13% of the variance in subjects' preferences, and the interaction term between innovation continuity and camera knowledge is the only significant predictor ($B = -.38$, $p < .05$). This interaction term suggests that camera knowledge is negatively associated with consumers' preferences for a digital camera. Model B outperforms model A in terms of its explanatory power, accounting for 28% of the variance in consumers' preferences. Consistent with prior research, both comprehension and perceived net benefits were significant, positive predictors of preferences ($B = .22$, $p < .10$ and $B = .41$, $p < .01$, respectively). Finally, Model C demonstrates that comprehension and net benefits substantially mediate the relationship between the camera knowledge by innovation continuity interaction and consumers' preferences, because that relationship is no longer significant and is approximately one-third its original size.

Summary and Discussion

This study provided support for H_1–H_4, demonstrating that the relationship between primary base knowledge and consumers' comprehension and perceptions of an innovation is not as straightforward as initially was thought. Innovation continuity significantly moderated these relationships.

For continuous innovations, our comprehension results were consistent with the expertise literature. Experts in the primary base domain reported higher levels of comprehension than novices did for innovations resulting from the change to a mutable feature. However, our results contradicted the expertise literature when the innovation was discontinuous. For discontinuous innovations, experts in the primary base domain reported lower comprehension levels than novices did.

Innovation continuity also moderated the relationship between prior knowledge and perceived net benefits. Compared with camera novices, camera experts perceived more net benefits in the continuous innovation but fewer in the discontinuous innovation. It appears that camera experts are better able than novices to understand the relations among the attributes in the continuous innovation, and this comprehension enables them to make positive goal-related inferences about the new camera's expected performance. Consequently, camera experts perceived more advantages and fewer risks in the film-based camera. For the digital camera, however, camera experts were not able to infer successfully how the features of the camera would enable them to achieve their existing goals, and consequently, they perceived fewer relative advantages and more risks.

Another interesting finding was that knowledge in a supplementary base domain, computers, had a positive and significant additive influence on subjects' comprehension of the discontinuous innovation. Subjects with higher levels of computer knowledge were able to apply that information to the digital camera. For this innovation, the supplementary knowledge was used to reason about an aspect of the product class not covered by the analogy to the primary base domain—the way images are processed. Because the supplementary base domain addressed a separate aspect of the product from the primary base domain, the influence of expertise in the supplementary base domain was independent from consumers' level of expertise in the primary base domain.

To examine further the influence of both primary and supplementary knowledge on the new product adoption process, we designed Study 2. Specifically, Study 2 tests H_1–H_4, in addition to the overall model, in a second product category. Furthermore, Study 2 includes enhanced dependent measures and additional process measures that are designed to capture subjects' knowledge transfer strategies.

STUDY 2

Design

As in Study 1, one factor was manipulated between subjects (innovation continuity) and two other factors were measured (knowledge in a primary and a supplementary base domain). Dependent measures consisted of scale items and written protocols measuring consumers' comprehension of the new product, perceptions of its relative advantages and risks, and overall preferences for the new product. Subjects also provided written protocols designed to assess their information-processing strategies.

Experimental Stimuli

During the brainstorming session used in Study 1, another plausible discontinuous innovation was mentioned, an electric car. Thus, we followed the same three-phase methodology established by Love and Sloman (1995) to assess the mutability of the features in the car category, the relevant primary base domain. The results from all three phases suggested that the engine was the most immutable car feature.[11] Thus, we developed two advertisements, one for an electric car and one for a traditional car with enhanced engine power. Again, the advertisements for each car were constructed to be as similar to each other as possible. The two advertisements shared the same layout; used the same headline, "Introducing the new Jupiter LV2000. The most advanced (electronic) vehicle of the new millenium"; and consisted of a color photograph of a real car with all brand markings removed and five described features.[12]

In a pretest, 120 subjects saw one of the two car advertisements and rated the continuity of the car on the same scales used in Study 1 (alpha = .82). The electronic car was rated as significantly more different (5.3 versus 3.1, $p < .01$) and innovative (5.0 versus 3.9, $p < .01$) and as leading to more significant change in use (5.6 versus 2.2, $p < .01$) than the traditional car.

Subjects and Procedure

As part of a class requirement, 110 undergraduates at a large southwestern university participated in a marketing research study.[13] Subjects arrived individually and were

[11]The engine was the least variable feature (mean = 95%), significantly less variable than all other features (all $p < .0001$) with the exception of the windshield wipers (mean = 94%). The engine also had the most other features depending on it (mean = 2.96), significantly more than all other features (all $p < .01$).

[12]The advertisement for the electronic car included the word "electronic" in the headline as well.

[13]Six subjects in the electronic car condition reported having had direct (i.e., in-person) experience with an electric vehicle. These subjects were subsequently removed from further analysis, which left a sample size of 104.

randomly given an experimental packet containing one of the two car advertisements and all the independent and dependent measures. The car advertisement appeared on the first page of the packet. Subjects were instructed to study the advertisement for 30 seconds and then answer the questions that followed (i.e., the dependent and independent variables). They were allowed to refer back to the advertisement as needed. The entire procedure took approximately 15 minutes.

Knowledge Measures

An eight-item multiple-choice/fill-in-the-blank test was used to assess subjects' objective knowledge of cars (alpha = .73). Questions on this scale were about the components and relations in a vehicle with an internal combustion engine. For example, one question asked, "If a car is overheating, which one of the following would it NOT be helpful to check?" A different question asked the subject to identify which components are part of the car's electrical system, and another asked for the two most common types of transmissions. For two of the fill-in-the-blank questions, it was possible to receive more than one correct point, making the highest possible score 11 points. Subjects' scores ranged from 0 to 11 (mean = 5.2).

A ten-item multiple-choice/fill-in-the-blank test was used to assess objective knowledge in a supplementary domain, electricity (alpha = .86). Questions assessed subjects' knowledge of electrical properties and components. For example, one question on this test asked about the primary function of a diode, and another asked the relationship between current, power, and voltage. The highest possible score on this test was ten, and subjects' scores ranged from zero to ten (mean = 4.4).

Dependent Measures

Comprehension. Comprehension was measured with four scale items (alpha = .84). On each seven-point scale, subjects reported how well they understood the advertised car and its features. For example, one item asked subjects to report the extent to which they (dis)agreed with the following statement: "After reading the ad, I have a very solid understanding of how this car works."

Net benefits. Net benefits were measured using subjects' written protocols. Subjects were asked to list the car's "most significant benefits and/or weaknesses." Under the question were eight blank lines on which they could write the perceived benefit or weakness, and under each line, they were asked to circle whether that item was a benefit or a weakness. The question stated, "Please list as many benefits and/or weaknesses as you feel are important." Net benefits were computed for each subject by simply subtracting the number of stated weaknesses from the number of stated benefits.

Knowledge transfer. In an attempt to gain a better understanding of the way subjects transferred (or attempting to transfer) knowledge, we gave them an opportunity to list any additional information they would like to have from the car's manufacturer if they were seriously considering purchasing the automobile. This question enabled us to determine if they were transferring or attempting to transfer attribute-based knowledge or relation-based knowledge. Two coders, blind to the subjects' conditions, coded subjects' responses as either attribute questions (e.g., "Does it come in a two-door model as well?") or relation questions (e.g., "How does it generate enough power to run the car without an engine?"). For each subject, we computed the number of attribute- and relation-based questions. The interrater reliability was .95 for attributes and .87 for relations. Disputes were resolved by a third coder.

Preferences. As in Study 1, preferences for the new product were measured with five-item scales that captured subjects' evaluations, attitudes, and purchase intentions for the product (alpha = .84).

Results

Comprehension. Regression was used to test H_1 and H_2 and examine the influence of supplementary electricity knowledge. Innovation continuity was included in the model as a dummy variable, and the discontinuous innovation (the electronic car) was coded as 1. In addition, the following were also included as independent variables: the main effect of car knowledge, the main effect of electrical knowledge, the predicted interaction between innovation continuity and car knowledge (H_1 and H_2), an interaction term for innovation continuity and electronic knowledge, and a three-way interaction term for innovation continuity × car knowledge × electronic knowledge. The results are shown in Table 2.

The main effects of innovation continuity and car knowledge were both positive and significant (B = .74, $p < .01$ and B = .48, $p < .01$, respectively). In addition, the interaction predicted by H_1 and H_2 between innovation continuity and car knowledge was also significant and in the hypothesized direction (B = –1.05, $p < .01$). Separate regression models were used to portray this interaction further (Table 2). For the traditional car, car knowledge was positively related to comprehension (B = .49, $p < .01$), but for the electronic car, the relationship was negative (B = –.55, $p < .05$).

The results also show an interesting influence of supplementary electronic knowledge on comprehension. Both the two-way interaction between electronic knowledge and innovation continuity and the three-way interaction among electronic knowledge, car knowledge, and innovation continuity were significant (B = –.76, $p < .05$ and B = 1.17, $p < .01$). As expected, electronic knowledge had no significant influence on consumers' comprehension of the traditional car. However, for the electronic car, a synergy between electronic and car knowledge emerged (B = 1.02, $p < .01$).

To understand this knowledge synergy for the electronic car better, we dichotomized both knowledge measures. The means (shown in Figure 3, Panel A) show that subjects high in both car and electronic knowledge reported higher comprehension levels than subjects having expertise in only one or in neither of the knowledge bases (15.2 versus 11.8, 10.5, and 11.8). These findings suggest that the two domains were acting together to explain the same aspect(s) of consumers' representations of the electric car, rather than showing a complementary relationship between primary base and supplementary base knowledge, as in Study 1.

Net benefits. To test H_3 and H_4, we again used regression, employing the same coding scheme and set of independent variables used to predict comprehension (Table 2). The main effects of both innovation continuity and car knowledge were not significant predictors of perceived net benefits. However, the interaction predicted by H_3 and H_4 between

Table 2

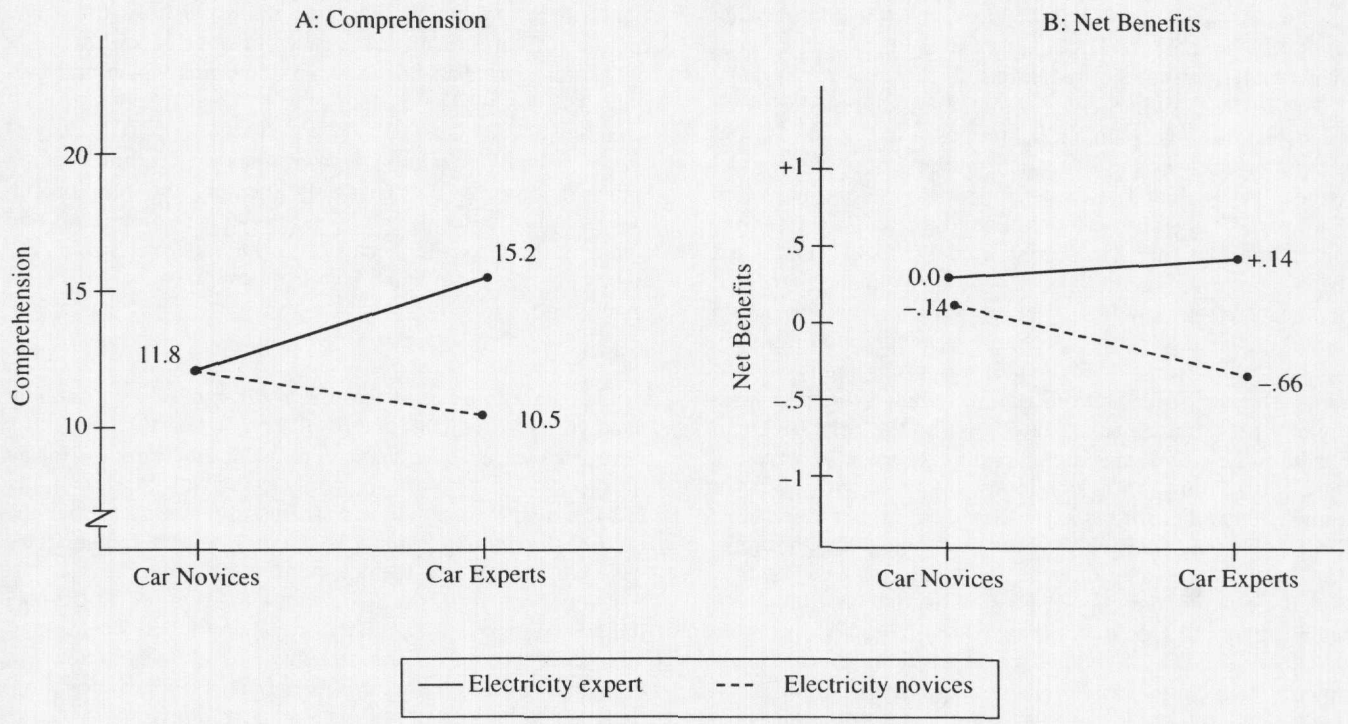
PREDICTORS OF COMPREHENSION, NET BENEFITS, AND PREFERENCES FOR CARS

	Innovation Continuity and Prior Knowledge							*Proposed Mediators*		
Dependent Variable	*Innovation Continuity*	*Car Knowledge*	*Electronic Knowledge*	*Car Knowledge × Electronic Continuity*	*Car Knowledge × Innovation Continuity*	*Electronic Knowledge × Innovation Continuity*	*Car Knowledge × Electronic Knowledge × Innovation Continuity*	*Compre-hension*	*Net Benefits*	R^2
Comprehension	.74***	.48***	.34	–.36	–1.05***	–.76**	1.17***			.16
Traditional cars only		.49***	.37	–.41						.14
Electronic cars only		–.55**	–.43	1.02***						.17
Net Benefits	–.18	–.20	–.57*	.48	–.64**	–.24	.47			.29
Traditional cars only		–.24	–.73*	.64						.09
Electronic cars only		–.79***	–.31	.95***						.20
Attribute-Based Questions	.10	.18	–.02	–.15	–.54*	–.50	.74**			.12
Traditional cars only		.17	–.02	–.17						.03
Electronic cars only		–.41*	–.58**	.81**						.10
Relation-Based Questions	–.04	.00	.00	.00	.74***	.48	–.84**			.23
Electronic cars only		.55**	.38	–.75**						.09
Preferences										
Knowledge/continuity model	.50*	.26	.28	–.32	–1.26***	–1.07***	1.42***			.32
Proposed mediators model								.29***	.44***	.32
Overall model	.43*	.20	.29	–.31	–.82***	–.89***	.95***	.24***	.31***	.45

*$p < .10$.
**$p < .05$.
***$p < .01$.

Figure 3

THE INTERACTIVE EFFECTS OF CAR KNOWLEDGE AND ELECTRICAL KNOWLEDGE ON COMPREHENSION AND PERCEIVED NET BENEFITS OF AN ELECTRIC CAR (STUDY 2)



innovation continuity and car knowledge was significant ($B = -.64$, $p < .05$). The relationship between car knowledge and perceived net benefits was negative for the electric car ($B = -.79$, $p < .01$), as we predicted in H_4, but was not significant for the traditional car.

The interaction between electronic knowledge and innovation continuity, designed to capture the main effect of electronic knowledge on the electronic car, was not significant ($B = -.31$, $p > .10$). However, the three-way interaction including car knowledge was significant, demonstrating a significant, positive synergy between the two knowledge bases for the electronic but not for the traditional car ($B = .95$, $p < .01$ versus $B = .64$, $p > .10$, respectively). The means presented in Figure 3, Panel B, demonstrate that people with expertise in both domains ascribed more net benefits to the innovation than did those with expertise in one or in neither base domain.

Knowledge transfer strategies. The hypotheses outlined in this study fundamentally depend on the prediction that experts and novices differ in terms of the types of mappings they construct (or attempt to construct) between the primary base and the target domain. Although the results reported thus far support these hypotheses, we included an additional measure in this study to provide further evidence regarding knowledge-based differences in mapping and transfer. Specifically, we gave subjects a chance to list the additional information they would like to have from the car's manufacturer if they were seriously considering a purchase.

After coding their information requests as either attribute-based knowledge or relation-based requests, we ran two sets of regressions using the number of attribute-based and relation-based questions as dependent measures (Table 2). Independent variables included innovation continuity, knowledge, and terms capturing the two-way and three-way interactions among these variables.

For both attribute-based and relation-based questions, the two-way interaction between car knowledge and innovation continuity and the three-way interaction were significant. However, the signs on these interaction terms were in opposite directions for attribute-based and relation-based questions. To understand these findings better, we ran separate regressions for each car type.[14]

The main effects of both car and electronic knowledge on the number of attribute-based and relation-based questions were small and insignificant for the traditional car. For the electronic car, however, car knowledge was positively related to the number of relation-based questions ($B = .55$, $p < .05$), and both car and electronic knowledge were negatively related to the number of attribute-based questions (car: $B = -.41$, $p < .10$; electronic: $B = -.58$, $p < .05$). These findings support the prediction that experts in the primary base domain favor relation-based mappings to attribute-based ones.

Experts in both domains, however, appear to have successfully used both domains to resolve the relation-based dissimilarities and to have moved on to requesting attribute-based information about the car. This conclusion is based on

[14] Because no relation-based questions were asked about traditional cars, only the results for the electric car are provided under that heading.

the signs for the three-way interactions found in both the attribute-based and relation-based regressions. For the electronic car, the combination of high car and high electrical knowledge was positively related to the number of attribute-based questions and negatively related to the number of relation-based questions. Taken together, these results provide additional support for H_1–H_4 and for the proposed mechanisms underlying these predictions.

Preferences. As in Study 1, three regression models were run to test the conceptual model proposed in Figure 1. Using car preferences as the dependent variable, the first model (Model A) included as independent variables innovation continuity, subjects' prior knowledge, and interactions among these factors. The second model (Model B) included the two proposed mediators—comprehension and perceived net benefits—as predictors of preferences, and the third model included all variables to test for mediation (Table 2).

The results from Model A indicate a marginally significant influence of innovation continuity on preferences, with higher preferences associated with the electric car. Furthermore, two significant interactions also emerge. Specifically, innovation continuity interacts with both car knowledge and electrical knowledge, and higher knowledge levels are associated with higher preferences for the traditional car and lower preferences for the electric car. The positive three-way interaction among innovation continuity, car knowledge, and electronic knowledge is graphed in Figure 4. Although electronic knowledge has little influence on car novices' and car experts' preferences for the traditional car, it interacts with car knowledge to influence preferences for the electronic car. Interestingly, subjects with low knowledge in both domains or high knowledge in both domains reported higher preferences than those who had high levels of knowledge in only one domain.

Model B, using only comprehension and perceived net benefits as predictors, explains approximately the same amount of variance in preferences as does Model A (R^2 = .32). As reported in Study 1, both comprehension and perceived net benefits were significant, positive predictors of preferences (B = .29, $p < .01$ and B = .44, $p < .01$, respectively). Finally, Model C demonstrates that comprehension and net benefits only partially mediate the relationship between the knowledge and continuity interaction terms and subjects' preferences, because the interaction term coefficients remain significant but drop approximately 30% in magnitude.

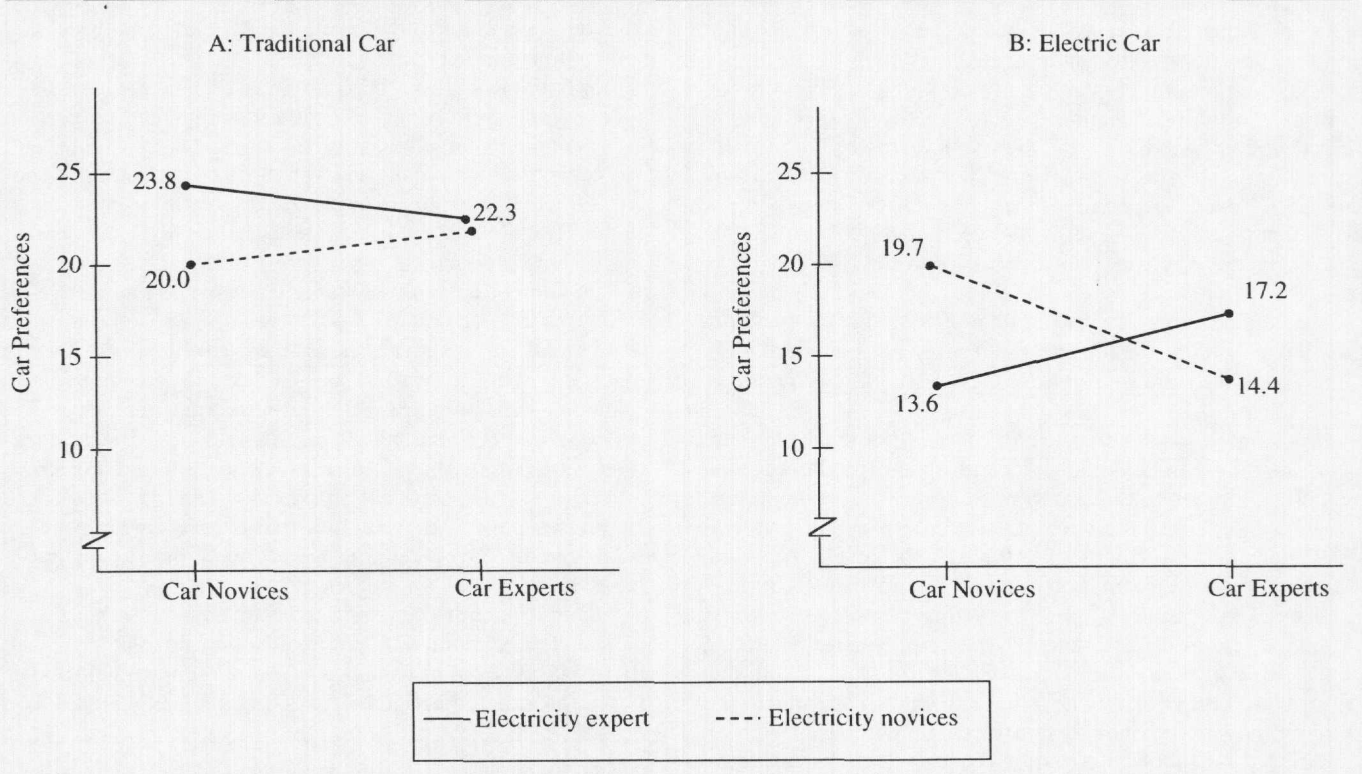
Summary

The goal of this study was threefold. First, the experiment enabled us to replicate the results predicted by H_1–H_4 in a new product category. Second, the additional process measures provided support for the mechanisms underpinning H_1–H_4. Third, the study enabled us to examine further the relationship among primary base knowledge, supplementary base knowledge, and the new product adoption process.

Overall, the results provide additional support for the idea that knowledge in the primary base domain may have a negative influence on the comprehension of, perceived net benefits in, and thus preferences for a discontinuous innovation. Only when high levels of primary base domain knowledge

Figure 4

THE INTERACTIVE EFFECTS OF CAR KNOWLEDGE, ELECTRICAL KNOWLEDGE, AND INNOVATION CONTINUITY ON CAR PREFERENCES (STUDY 2)



were combined with high levels of supplementary base knowledge were people able to overcome their difficulty in comprehending the discontinuous innovation and see the benefits associated with it.

This study also reveals a different relationship between the primary and supplementary base domains. For the electric car, the supplementary base domain was used to augment knowledge carried over from the analogy to the traditional, gas-powered car. Thus, to use knowledge about electricity, subjects first needed to know where there were gaps in the their knowledge about the internal mechanisms of cars. Only people with a high degree of expertise in the primary base domain would even know why the supplementary base domain was relevant. For this reason, we observed that the influence of expertise in the supplementary base domain depended on the degree of that consumer's expertise in the primary base domain.

More generally, the results from this experiment, when combined with those from Study 1, highlight that the relationship between expertise and the processing of new information is more complex than initially was thought. The relationship is not one-directional or necessarily independent of other types of knowledge. Taken together, these two studies contribute to the understanding of how background knowledge is used in interpreting new information.

GENERAL DISCUSSION

In this era of diminishing product life cycles and rapid technological advancements, it is critical for firms to identify and target innovation-prone consumers effectively. A clear understanding of the factors affecting consumers' adoption processes is crucial to the development of an effective marketing strategy.

In this research, we proposed and tested a model of the processes underlying a person's adoption decision. Two studies demonstrated the significant influence of prior category knowledge, in both a primary and a supplementary domain, on consumers' preferences for new products. In general, our results show that the relationship between expertise and the processing of new product information is more complex than the literature currently implies. Only when a new product was relatively continuous did the information processing benefits afforded by expertise in the primary base domain facilitate adoption by increasing both comprehension and perceived net benefits. When the new product was discontinuous, however, expertise entrenched in the primary base domain created resistance by reducing both comprehension and perceived net benefits.

Our research also demonstrated that knowledge in multiple domains can influence the adoption process for discontinuous innovations. In Study 1, we found that supplementary knowledge complemented primary knowledge to influence subjects' comprehension in an additive way. However, in Study 2, primary and supplementary knowledge acted together to influence comprehension jointly. We propose that the relationship between a primary and supplementary base domain depends on whether expertise in the primary base domain is required to understand where to apply the secondary base domain knowledge.

Further research is necessary to illuminate the factors that determine when the relationship between primary and supplementary knowledge is additive and when it is interactive. As a first step, we need a better understanding of how supplementary knowledge influences consumers' representations of new products. It may be that knowledge transfer from a supplementary base is different from transfer from a primary base because consumers may not map information and carry over relations to form a basic structure. Rather, consumers may apply their existing knowledge from an additional domain to fill in missing information in the new representation. By "applying knowledge," we mean that consumers are using logical schemas or other inferential processes to fill in the gaps left after transferring knowledge from the primary base domain. A further examination of the way knowledge is transferred from multiple domains and used to form new representations would contribute significantly to the understanding of consumer learning.

Managerial Implications

Segmentation. Our findings reveal that consumers with differing degrees and combinations of product knowledge respond differently to innovations, indicating that knowledge may be used as an effective segmentation tool. For example, in Study 1 we found that consumers low in camera knowledge yet high in computer knowledge are the most likely to purchase a digital camera, whereas those high in camera knowledge and low in computer knowledge are the least likely to adopt this innovation. Thus, advertising the digital camera in *PC Magazine* would likely be more effective than advertising it in *Popular Photography*. Furthermore, highlighting the computer-related benefits (e.g., uploading to Web pages) should lead to higher preferences than touting the camera-related benefits (e.g., picture quality). The findings of Study 2 also suggest that this segmentation should be done at a finer level. In this study, car experts lacking in electrical knowledge provided the most resistance to the electric car. The car experts with electrical knowledge were much more open to the innovation. Therefore, marketers targeting experts in the primary domain should design advertising campaigns that educate consumers about the supplementary bases.

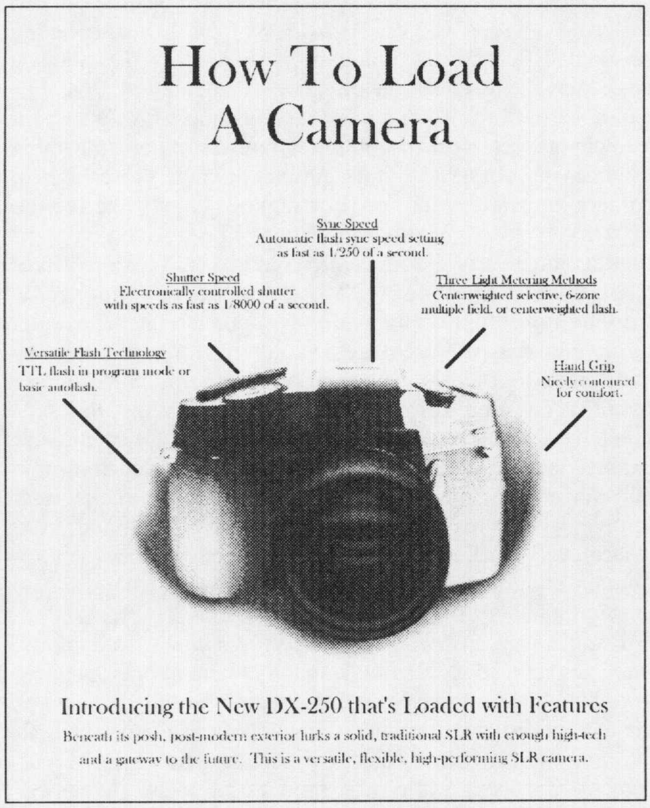
Establishing switching costs (postpurchase). One of the implications of this research is that there are strong cognitive switching costs for experts because their knowledge structures are entrenched and difficult to change. Marketers might capitalize on these switching costs by increasing the depth of consumers' knowledge after the product has been purchased, thereby turning novices into experts. For example, consumers new to electronic pocket organizers may choose to purchase a Palm Pilot because of its reputation. The Palm Pilot may be perceived as reasonably simple at the time of purchase, because the novices do not fully understand all of its capabilities. However, the more the novices learn, the more well developed their knowledge structures will be and the less likely they will be to switch to a different type of organizer when upgrading. Therefore, Palm Pilot might benefit from increasing its customers' perceptions of the product's complexity after the purchase has been made by providing product training courses and/or educational newsletters in order to establish a more knowledgeable, and therefore more loyal, customer base. This area for further research may facilitate a better understanding of the inertia component of product loyalty.

Identification of innovators. One of the key, consistent findings in diffusion research is that innovators are characterized by heavy product category usage and experience (Gatignon and Robertson 1991). Although this may be true for relatively continuous innovations, our results imply that the innovators (i.e., early adopters) for discontinuous innovations may be novices in the primary base domain. Experts in the primary base domain may be more accurately categorized as laggards than as innovators when confronted with a really new product. Further research should examine the differences between the innovators for continuous and discontinuous innovations for both consumer and industrial goods.

In summary, this research raises and addresses several interesting questions, both theoretical and managerial in nature. Its most important findings are (1) that multiple knowledge bases provide information for forming a mental model of a new product and (2) that experts are, ceteris paribus, not more prone than novices to adopt discontinuous new products. Further research should seek a better understanding of how experts and novices respond to innovative products. Moreover, a serious reexamination of the conventional wisdom that suggests that it is best to market new products to experts (heavy users) is required in the case of really new products.

Appendix

STIMULI: CONTINUOUS AND DISCONTINUOUS CAMERA ADVERTISEMENTS



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