Optimal Visualization Aids and Temporal Framing for New Products

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ABSTRACT

Conventional wisdom suggests that more concrete and detailed information is always helpful in evaluating new products. The current research however demonstrates that when consumers use visualization to evaluate new products, the value of concrete versus abstract visualization is dependent on the temporal perspective taken by the consumer. Specifically, concrete information is beneficial when product visualization is retrospective in nature (i.e., focused on the past), whereas abstract information is found to be more helpful when product visualization is anticipatory in nature (i.e., geared toward the future). This occurs because the match between visualization aids and consumers’ temporal construal facilitates the extent of imagery processing realized, which in turn enhances new product evaluation. When the new product is very difficult to visualize, this pattern of effects is attenuated. Further, the effect is reversed when the product is highly familiar (i.e., not a new product) as pre-existing memories are shown to hinder imagery processing. Theoretical and practical implications are discussed.
Imagine that you are the product manager for the Google Glass, a new product where a small screen is placed in a pair of glasses that displays information and has the ability to take pictures automatically. When considering the most effective way to communicate the benefits of the Google Glass, you decide to encourage consumers to visualize themselves using the product and you provide them with lots of detailed examples of using this new product. Indeed, common wisdom suggests that demonstrating rich and detailed product uses should enhance preferences. Does this intuition hold? Does providing numerous, detailed visualization aids work as an effective strategy to improve consumers’ evaluation of the Google Glass?

In this paper, we examine how providing visualization aids impacts consumers’ new product evaluations, and propose that the effectiveness of this cognitive approach depends on the temporal perspective consumers take. For example, when evaluating the Google Glass product, consumers could take a retrospective view, and imagine that they used the Google Glass during their last party to take automatic pictures of the party events. Alternatively, they could take an anticipatory view, and imagine using the Google Glass at an upcoming party to take pictures. We show that while providing more detailed visualization aids improves new product evaluations under a retrospective mindset, detailed visualization aids are not advantageous when consumers take an anticipatory view and visualize using the new product in future scenarios (which is the default perspective they tend to take when evaluating new products).

To explain this discrepancy, we draw from research that has shown that an individual’s mindset, whether retrospective or anticipatory, can be concrete or abstract respectively (Grant and Tybout 2008; Weick 1979). Importantly, we show that promotional information that acts as a visualization aid in new product evaluation can improve or diminish new product evaluations, depending on whether the concreteness (abstractness) of the aid matches consumers’ temporal
perspective (Higgins 2000; Lee and Aaker 2004; Petrova and Cialdini 2005): When visualization is retrospective and related to past usage scenarios, detailed and concrete visualization aids should lead to more positive product evaluations. However, when visualization is anticipatory and geared toward future usage, general and abstract visualization aids are predicted to lead to more positive product evaluations. Importantly, we show that this match-based effect is realized for new products that consumers are able to visualize, but is attenuated when the new product is very difficult to visualize, and reversed when the product is highly familiar (i.e., not a new product for the consumer). In the next section we provide theoretical support for these predictions before detailing four experimental studies where we manipulate the concreteness/abstractness of the visualization aids used to facilitate new product evaluation under either retrospective or anticipatory visualization.

THEORETICAL FRAMEWORK

Visualization and New Product Evaluation

Visualization has been examined in multiple consumer behavior contexts, including advertising effectiveness (Thompson and Hamilton 2006), preference formation (Petrova and Cialdini 2005), anticipatory satisfaction with an experience (MacInnis and Price 1987, 1990), and creativity in product design (Dahl, Chattopadhyay, and Gorn 1999). In the new product domain, recent research has examined the effect of consumer visualization when accompanied by different forms of visualization guidance. For example, Dahl and Hoeffler (2004) found that encouraging consumers to use a third-person perspective when visualizing using new products led to higher product evaluations compared with self-focused visualization. Further, visualization centered in imagination has been shown to lead to higher evaluations of a new product, whereas
memory-focused visualization has less of an impact because it naturally constrains consumers’ images to their existing product experiences (Zhao, Hoeffler, and Dahl 2009).

While existing research in the new product domain has mainly examined the direction of visualization (e.g., self- vs. others-focused, outcome- vs. process-oriented, imagination- vs. memory-focused), very little has been done with respect to understanding promotional aids/tools that can potentially facilitate visualization for the consumer. An important difference between new products and existing products is that consumers do not have as many prior experiences with new products as with existing products. Therefore it is often hard for consumers to visualize using new products without receiving external aids such as product usage examples. Indeed, both marketing practice and previous research (e.g., Castano et al. 2008) have pointed to the potential value that visualization aids can have for the consumer in this context. Given this identified potential, what are best practices for marketers in providing visualization aids to prospective consumers? While common wisdom might suggest that simply providing numerous detailed usage examples is best, we suggest that the most effective approach in providing visualization aids to a consumer faced with evaluating a new product is more nuanced than one might think. In the next section we identify the importance of mental construal and temporal perspective in defining the most effective approach here.

Matching Visualization Aids to Temporal Perspective

Research on retrospection and anticipation has shown that people have different mental representations of events in the past and in the future. Specifically, existing research has demonstrated that past events are generally perceived or construed as more detailed and concrete whereas future events are construed as more general and abstract (Grant and Tybout 2008; Van
Boven et al. 2008; Weick 1979). For example, in a recent study where participants were asked to choose whether a series of actions were better identified by a concrete or abstract description, the results showed that actions in the future were identified more with abstract descriptions than actions in the past (Van Boven et al. 2008). In another study, where participants were asked to describe a car accident, participants’ accounts included a description of the general context when the accident was an imagined future car accident. However, when they were instructed to assume that the accident had already occurred their descriptions became more concrete and included more specific details about what had happened (Weick 1979).

Given people’s different mental representation for past and future scenarios with different levels of concreteness, how will visualization aids at different level of concreteness impact the evaluation of new products? We believe that the impact of visualization aids is dependent on whether there is a match of the construal levels associated with the visualization aids and the temporal perspective taken by the consumer.

Existing research on consumer decision making over time has demonstrated that the type of thoughts that have the greatest impact on evaluation occur when the external stimuli fit the consumers’ internal mindset (Higgins 2000). In the marketing literature, research has shown that a fit between the message frame and a consumer’s regulatory focus led to higher persuasiveness of the message (Lee and Aaker 2004), a fit between the imaginability of the product stimuli and the dispositional imagery vividness of the individual leads to a more positive attitude towards a product (Petrova and Cialdini 2005), and the fit between ad format and consumer’s information processing mode enhances advertising effectiveness (Thompson and Hamilton 2006).

In the new product domain, research has shown that a match of the external stimuli and the consumer’s natural construal level enhances new product evaluation. For example, for near
future decisions (when people naturally think more about the process of using a product), process orientated visualization led to higher new product evaluation (Castano et al. 2008). Conversely, for the distant future, where people’s natural mental construal is more about the benefits of using the product, a more outcome-focused visualization led to higher product evaluations (Castano et al. 2008). We build on this prior research (Castano et al. 2008) and extend it in a number of ways: First, while Castano and colleagues (2008) have focused on near vs. distant future, we examine the role of visualization aids (with different levels of concreteness) under a retrospective or anticipatory mindset. Given the positive role of relating a product to the past that has been shown in the consumer memory literature (Burnkrant and Unnava 1995; Debevec and Romeo 1992; Sujan, Bettman and Baumgartner 1993), and the neglected or underestimated role of retrospective visualization in the new product literature (Castano et al. 2008; Hoeffler 2003; Zhao et al. 2009; Zhao, Hoeffler and Zauberman 2011), identifying the potential effectiveness of retrospective visualization is important. Second, we identify ease of visualization produced by product familiarity to be an important moderator to the defined match effect documented. As will be discussed in the next section, we find the ease with which consumers can visualize directly impacts the likelihood of a matching effect being realized.

Based on the aforementioned findings regarding the general effect of match (Castano et al. 2008; Lee and Aaker 2004; Petrova and Cialdini 2005; Thompson and Hamilton 2006), we predict that a match of the concreteness between visualization aids and temporal perspective of the visualization would enhance positive evaluations of new products. Since people’s natural mental construal for the past tends to be concrete and their natural mental construal for the future tends to be abstract, we argue that detailed visualization aids are not always more helpful. Instead, we hypothesize that:
H1: When consumers are evaluating new products, detailed visualization aids lead to higher new product evaluation for retrospective visualization whereas abstract visualization aids lead to higher new product evaluation for anticipatory visualization.

An important premise in the persuasion literature is that people are more likely to scrutinize information at hand when it is consistent with their current mental representational state (Petty and Wegener 1998). Further, prior research in marketing has indicated that a match between the type of information and the type of processing utilized by the consumer can enhance the imagery accessibility and the resulting effect of marketing communication (Petrova and Cialdini 2005). Similarly, research has also shown that when people encounter information that is congruent with their natural mental construals, they are likely to experience processing fluency which increases ease and clarity of the imagery and enhances evaluation (Kim, Rao, and Lee 2008; Thompson and Hamilton 2006). Finally, past research has also shown that external information that strengthened visualization and led to consumers’ self-referencing helps increase evaluation of a product (Krishnamurthy and Sujan 1999). In accordance with prior research we define the extent of imagery processing to be a meta-construct that encompasses the depth and richness with which a consumer envisions using a product. We predict that as a result of the match between temporal perspective and visualization aids, consumers will engage in a deeper visualization experience leading to an increase in the extent of imagery processing that will mediate the interaction predicted above. It follows:

H2: Increases in the extent of imagery processing mediates the interaction between the type of visualization aids and the temporal perspective taken by the consumer during new product evaluation.
The Moderating Influence of Ease of Visualization

Low Familiarity and Ease of Visualization. If as predicted, the match of the construal levels leads to higher new product evaluation because it facilitates increases in the extent of imagery processing, then an intuitive prerequisite for this enhanced imagery processing is that consumers must be able to generate mental images of product usage, even if the product is a new product. That is, although the match of the concreteness between time and visualization aids provides a mindset for facilitated visualization, the consumer still needs content for the visualization to occur. Indeed, past research has shown that product familiarity and prior knowledge plays an important role in people’s ability to visualize how one interacts with a product (Debevec and Romeo 1992). Although consumers’ familiarity with new products is generally not as high as existing products, consumers can often refer to a similar product to see themselves using the new product (Gregar-Paxton and Moreau 2003).

However, if people are not at all familiar with a product and lack the necessary knowledge about similar product usage scenarios, their visualization of using the product will be difficult and might be impaired. In other words, too little content due to low familiarity reduces ease of visualization because some content is required for visualization. Similarly, prior work has demonstrated that people low in dispositional imagery vividness do not benefit from imagery appeals, and that non-experiential information undermines the effect of imagery, because imagery fluency is disrupted in those situations as visualization becomes harder (Petrova and Cialdidi 2005). Based on these prior findings, we predict that the effect of the match between time and visualization aids on new product evaluation will be attenuated when it is difficult for consumers to visualize using the new product.
**High Familiarity and Ease of Visualization.** Prior research (Krishnamurthy and Sujan 1999) has shown that it is possible that consumers can have too many existing mental images or autobiographical memories leading to interference with promotional information and resulting in the impairment of retrospective visualization. While having too many autobiographical memories is typically not the case for new products, it is possible that a second boundary condition that parallels the findings of Krishnamurthy and Sujan (1999) can be identified in the context we study. Specifically, if a substantial number of vivid mental images associated with a product are easily available (due to high familiarity with the new product), providing detailed visualization aids will facilitate autobiographical imagery, lead to interference, and result in lower evaluations when the visualization is retrospective. That is, too much content due to high familiarity can impair visualization due to interference. In contrast, an abstract ad will likely benefit evaluations under retrospection as it would be less likely to produce autobiographical images that impair the visualization effort. To test this possibility, in Study 3, we explicitly investigate this potential reversal of our matching effects when ease of visualization is high due to product familiarity. In sum:

H₃: Ease of visualization moderates the matching effect of temporal perspective and visualization aids on new product evaluation such that a) the effect is attenuated when ease of visualization of the new product is very low, and b) reversed when ease of visualization is very high.

**Summary of Studies**

We conduct four studies to test these hypotheses. In Study 1, we test the basic interactive effect of temporal perspective and visualization aids on the evaluation of a new Tablet PC (H₁),
as well as the mediating role of the extent of imagery processing as the underlying mechanism (H2). In Studies 2 - 4, we examine the moderating role of ease of visualization (H3). Similar to the approach utilized by Petrova and Cialdini (2005), we examine the moderation of visualization ease at both the individual level and product level, first manipulating ease of visualization via an individual’s familiarity with the product (Heart Rate Monitor in Study 2 and Vacation Destination in Study 3), and then manipulating ease of visualization via the framing of the new product (Google Glass in Study 4). In all studies we show a replication of the match-based effect when visualization is moderately easy (i.e., for regular runners who have some familiarity with heart rate monitors; when the vacation destination has some level of familiarity; or when the more visualizable features of Google Glass are emphasized), but an attenuated effect when the ease of visualization is very low (i.e., for non-runners who have very little familiarity with heart rate monitors; when the vacation destination is very unfamiliar; or when the less visualizable features of Google Glass are emphasized). Finally, we show a reversal of the match effect when ease of visualization is very high (i.e., when the product is highly familiar to the participants and their prior images may interfere with their visualization). In addition, Studies 2 and 4 further confirmed the mediating role of the extent of imagery processing in our conceptualization.

STUDY 1

Study 1 was conducted to test H1 and H2. We manipulated concreteness of the visualization aids and the temporal perspective of the consumer to examine whether the match between the visualization aids and the temporal perspective taken would lead to more positive
product evaluations. Further, we tested the mediating role of the extent of imagery processing facilitated by the match of the construal level and visualization aid.

Method

One hundred and twenty-one people were recruited to complete the study online at the e-lab of Vanderbilt University and were offered the chance to win a $100 prize. These participants had a mean age of 45 and a substantial range (between 24 and 68). Their average education level was college and ranged between high school and post-graduate. The study was a 2 (temporal perspective: retrospective vs. anticipatory) × 2 (concreteness of visualization aids: abstract vs. concrete) between-subjects design.

Procedure. Participants were randomly assigned to one of four conditions. Participants first read information about a new product. Next, they received instructions and visualization aids according to the assigned experimental condition. After they visualized this new product per the instructions, participants described their mental images and completed the dependent measures.

Product Stimuli. All participants evaluated a mock advertisement of a Tablet PC. The product information sheet had four components: the headline, the picture, a short description of the product underneath the picture, and a set of product features. The headline stated: “The BT-100 is the mobile product for people on the go.” The short description underneath the picture paralleled the headline: “The BT-100 notebook and digital notepad allows users to integrate paper-based information into the digital workspace efficiently.” After the short description, each product included a list of eight features (see Web Appendix C).

Temporal perspective. In the retrospective conditions, participants were instructed to relate the product to a scenario in the past where they could have incorporated the product. In the
anticipatory conditions, we asked participants to relate the product to a scenario in the future where they could incorporate the product.

Concreteness of the visualization aids. Participants were then provided with a sample activity as a visualization aid. In the abstract conditions, the description contained no details and was rather general, as follows:

“Taking notes in class and pasting them directly into class handouts downloaded from the course website.”

In the concrete conditions, the description of the activity was very concrete and detailed, as the following example from the retrospective temporal perspective demonstrates (note the tense was adjusted in the anticipatory conditions):

“You could relate BT-100 to a class that you have taken in the past. The instructor was giving a lecture, and you were taking class notes on the notepad with the digital pen. Writing directly on the paper was faster and smoother than typing, and your handwriting was transferred to the computer instantly. You were also able to write down formula and graphs that the instructor drew on board. At the end of the class, you pasted your notes into the class handouts that you have downloaded from the course website, and saved your work as an electronic file under your class folder.”

Measures. After participants performed their visualization based on the instructions and described their mental images, they proceeded to the questionnaire. Study 1 captured participants’ evaluation for this new product by asking them to indicate their overall evaluation of the BT-100, how they would rate the BT-100, how seriously they would consider purchasing the BT-100 and the likelihood that they would buy the BT-100 on a nine-point scale, anchored by 1 (“not at all”) and 9 (“very much”). Further, we measured participants’ extent of imagery processing by asking them how much they used visualization and to what extent they envisioned the scenario during the visualization, based on nine-point scales. As a manipulation check for the concreteness of
visualization aids, participants rated how detailed the examples that they received at the beginning of the study were, based on a nine-point scale (1 = “not at all”, 9 = “very detailed”).

Results

A descriptive analysis identified two outliers in the data set whose scores of the evaluation measures were over 3 standard deviations away from the mean. These two outliers were excluded from the analysis below, resulting in a sample of 119 participants. Note that all the focal results hold when these outliers are included in the dataset.

Manipulation check. A two-way ANOVA showed only a significant main effect of the visualization aid concreteness on the rating of the example’s level of detail ($F(1, 115) = 31.46, p < .001$): Participants in the concrete conditions rated the examples to be significantly more detailed than participants in the abstract conditions ($M_{concrete} = 7.55$ vs. $M_{abstract} = 5.72$).

Product Evaluation. The four product evaluation questions were aggregated into a product evaluation index ($\alpha = .89$). A 2-way ANOVA showed no main effect of the concreteness of the visualization aids ($F(1, 115) = .20, p = .65$), or temporal perspective ($F(1, 115) = 2.03, p = .16$), but the predicted interaction between these two factors was significant ($F(1, 115) = 9.59, p < .005$; see Figure 1). Consistent with our hypothesis, when participants were asked to relate the product to the future, concrete visualization aids actually lead to lower product evaluations than abstract visualization aids: ($M_{abstract} = 7.69$ vs. $M_{concrete} = 6.86$; $F(1, 115) = 6.18, p < .05$). When participants were asked to relate the product to the past, concrete visualization aids led to higher product evaluations ($M_{concrete} = 7.39$ vs. $M_{abstract} = 6.28$; $F(1, 115) = 3.56, p = .06$). These results provide initial support for $H_1$. 

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Mediation analysis for the extent of imagery processing: The two extent of imagery processing measures (amount of visualization and scenario envisioned) were aggregated to create an extent of imagery processing index ($\alpha = .74$). Regression analysis showed a significant interaction of temporal perspective and visualization aids on the extent of imagery processing ($b = -1.61, t(115) = -2.79, p < .01$). To test whether extent of imagery processing mediated the interactive effect of temporal perspective and visualization aids on product evaluation, we performed 1,000 bootstrap resamples using Preacher and Hayes’ (2008) SPSS macro, as recommended by Zhao, Lynch, and Chen (2010), and considered the bias-corrected 95% confidence interval. Because this interval (-1.9071 to -.3118) did not include zero, and the interactive effect of temporal perspective and visualization aids was reduced in significance after we controlled for extent of imagery processing ($b = -.90, t(114) = -1.73, p = .09$ vs. $b = -1.94, t(115) = -3.10, p < .005$), we conclude that extent of imagery processing partially mediated the effect of temporal perspective and visualization aids on product evaluation (see Web Appendix B for details). These results provide support for H2.

Discussion

The results in Study 1 are consistent with our first hypothesis (H1) showing that while concrete visualization aids increased product evaluations for retrospective visualization, when it came to anticipatory visualization, concrete aides lost their advantage and it was abstract visualization aids that enhanced new product evaluations. In addition, the mediation analysis showed that the match of the construal levels between the visualization aids and temporal
perspective enhanced the extent of imagery processing, which led to higher new product evaluations (and provided support for H2). An important premise underlying the effectiveness of match between visualization aids and temporal perspective and resulting enhanced imagery processing is that people are able to create sufficient mental imagery during visualization. If the ease of visualization of new products was hampered, the match of concreteness would not matter. This premise is examined in studies 2 and 3 (via product familiarity) and study 4 (via product positioning).

STUDY 2

In Study 2, we examine the moderating role of ease of visualization by measuring familiarity with the product category. Consistent with existing findings that indicate people’s ability to visualize a product depends on one’s related experiences (Debevec and Romeo 1992; Maheswaran and Sterntal 1990), we argue that although people’s familiarity with new products in general is lower than their familiarity with existing products, they should have a moderate degree of familiarity with similar product usage scenarios, such that they would be able to construct relevant visual images. If consumers are highly unfamiliar with the product, they will find it difficult to draw from their prior knowledge of using similar products and the mindset match would have less of an impact on their evaluation of the product. In Study 2, we directly compare people who have very little familiarity with a product category to those that have moderate level of product familiarity.

Method
One hundred and thirty people were recruited at the e-lab at Vanderbilt University to complete the experiment and were offered the chance to win a $100 prize. Participants had a mean age of 41 and a substantial range between 19 and 75. Their average education level was college and ranged between high school and post-graduate. The experiment was a 2 (temporal perspective: retrospective vs. anticipatory) x 2 (concreteness of visualization aids: abstract vs. concrete) x 2 (familiarity: low vs. moderate) between-subjects design (where familiarity was measured and the other two factors were manipulated).

Procedure. Participants were randomly assigned to one of the temporal perspectives by visualization aid conditions. The procedure of Study 2 followed that of Study 1.

Product Stimuli. All participants evaluated a mock advertisement of a new heart rate monitor on the market that we named “ST-600” in our study. Similar to previous studies, the product information sheet had four components: the headline, the picture, a short description of the product underneath the picture, and a set of product features. The headline stated “The ST-600 is the Heart Rate Monitor of Choice!” The short description beneath the picture paralleled the headline: “The ST-600 heart rate monitor provides runners with the best possible running data.” After the short description, the product included a list of seven features (see Web Appendix C).

Temporal perspective. As in Study 1, after participants examined the product information, they were asked to relate the ST-600 to a scenario in the past [in the future] where they could have used [could use] this product.

Concreteness of the visualization aids. Participants then received the manipulation of visualization aids, which was similar to that in Study 1. In the abstract conditions, the description contained no details and was rather general, as follows:
“Wearing the ST-600 while running and then downloading the data wirelessly afterwards.”

In the concrete conditions, the description of the activity was detailed, as the following example from the retrospective temporal perspective demonstrates (note the tense was adjusted in the anticipatory conditions):

“*You were wearing the ST-600 on your wrist and running on a trail in a park. The strap was comfortable and adjusted nicely to fit your wrist. You were running at your usual pace. A casual glimpse on the ST-600 confirmed that your data was being continuously monitored. After you were back home, you released the strap, and let the USB stick download your running data wirelessly from the ST-600 to your PC for further analysis.*”

**Measures.** After participants performed their visualization based on the instructions and described their mental images, they proceeded to the same 4-item product evaluation measure used in Study 1, the same 2-item measure of imagery processing, and the same manipulation checks for concreteness of the examples. Further, we also included a manipulation check of temporal perspective by asking participants how much they had related this product to the past vs. future during the visualization task (1 = “A lot to the past”, 9 = “A lot to the future”). We used the same manipulation of temporal perspective in the next two studies with the same manipulation check question, and the results confirmed our manipulation of temporal perspective. Therefore, we no longer discuss this manipulation check in later studies. To capture participants’ familiarity with the product, we asked them how familiar they were with heart rate monitors. All questions were based on 9-point scales.

**Results**

**Manipulation checks.** A 2 (temporal perspective) x 2 (visualization aids) x 2 (familiarity) ANOVA showed only a significant main effect of visualization aids on the detail rating \( (M_{\text{concrete}}\)
= 7.40 vs. $M_{\text{abstract}} = 6.78$; $F(1, 122) = 4.05, p < .05$). Also, we found only a significant main effect of temporal perspective on participants’ temporal orientation ($M_{\text{future}} = 6.47$ vs. $M_{\text{past}} = 5.68$; $F(1, 122) = 4.02, p < .05$), confirming the effectiveness of our manipulations. Participants’ familiarity with heart rate monitors had a mean of 5.27 and SD of 2.39.

**Product evaluation.** Because the design involved a continuous variable (i.e., familiarity), we conducted linear regression analysis that included temporal perspective, visualization aids, the continuous mean-centered index for familiarity, as well as the two-way and three-way interactions created among those three factors as predictors. The dependent variable was the aggregated evaluation index based on the four product evaluation questions ($\alpha = .86$). The results showed significant two-way interactions between temporal perspective and familiarity ($b = -1.09$, $t(122) = -2.94, p < .005$), visualization aids and familiarity ($b = - .80$, $t(122) = -2.05, p < .05$), but most importantly, a significant three-way interaction between those factors ($b = .67$, $t(122) = 2.67, p < .01$).

To analyze the interaction, regression lines were plotted 1 standard deviation above and 1 standard deviation below the mean for the mean-centered index of familiarity (Aiken and West 1991; Preacher, Curran, and Bauer 2006; see Figure 2). Analysis revealed that when product familiarity was moderate the results replicated the findings in Study 1, as there was a significant interaction between temporal perspective and visualization aids on product evaluation ($t = 1.93$, $p = .05$). Simple slope analysis showed that for these participants with moderate familiarity, when the visualization was anticipatory, abstract aids led to more positive product evaluations ($b = -.75$, $t(122) = -6.08, p < .001$); whereas when the visualization was retrospective, concrete aids led to higher product evaluation than abstract aids ($b = -2.86$, $t(122) = -2.19, p < .05$). When product familiarity was low, there was no longer a significant interaction between temporal
perspective and visualization aids ($t = -1.03, p = .30$). Further simple slope analysis showed that for these low familiarity participants, when they were asked to relate the product to a past scenario, concreteness of the visualization aids did not impact participants’ evaluation ($b = .96, t(122) = .74, p = .46$), whereas for anticipatory visualization, concrete aids led to higher evaluation than abstract aids ($b = -.17, t(122) = -2.21, p < .05$).

Mediation analysis for the extent of imagery processing: The two imagery processing measures were again aggregated ($\alpha = .83$). Regression analysis showed a significant three-way interaction of temporal perspective, visualization aids and product familiarity on the extent of imagery processing ($b = -2.26, t(122) = 1.92, p = .05$). Bootstrap analysis based on 1,000 bootstrap resamples again showed that the extent of imagery processing partially mediated the effect of temporal perspective, visualization aids, and product familiarity on product evaluation (95% CI: .0222 to 1.6201; change of three-way interaction in significance after controlling for the mediator: $b = -2.78, t(121) = 2.46, p < .05$ vs. $b = -3.44, t(122) = 2.96, p < .005$; see Web Appendix B for details). These results provide further support for H2.

Discussion

Providing support for H1, H2, and H3a, Study 2 demonstrated that ease of visualization moderates the effect of construal match on product evaluation. We measured category familiarity and found that for those who had a moderate level of category familiarity, and thus a relatively easier time visualizing the new product, more detailed visualization aids did not lead to higher product evaluation for future-oriented visualization. It was the match of the concreteness
between temporal perspective and visualization aids that increased product evaluation (due to the extent of imagery processing facilitated by the match). For people who had low category familiarity and thus little prior experience to support their visualization, this pattern was attenuated: the type of aids didn’t matter under retrospective orientation, and concrete aids led to more positive evaluations than abstract aids under an anticipatory orientation. We believe that for those who had low familiarity with heart rate monitors, it was difficult to picture themselves running and using this product in the past (Zhao et al., 2009), thus the match of the construal level and the content of the visualization aids in this condition had limited impact on evaluations. However, because imagining a future scenario is generally less constrained, aids with more detail had a stronger impact for those who had a lack of familiarity with the product category and thus needed some details to guide them on how to use this product.

STUDY 3

Study 2 replicated the effect of match between visualization aids and temporal perspective when the new product is moderately familiar and thus affords relatively higher ease of visualization, but showed an attenuation of the effect when the product is unfamiliar to the consumers and consumers had very little prior experience to draw on for their visualization. In Study 3, we test another boundary condition based on prior work (Krishnamurthy and Sujan 1999) when a product is highly familiar and can evoke numerous autobiographic memories (H3b). Although most new products are unlikely to have a high familiarity level typical of known products, it will be conceptually interesting to reconcile our match effect with the interference effect identified in prior work. Also, one concern in Study 2 could be that there was no control
condition that served as a familiarity benchmark. In Study 3, we provide a common benchmark for different levels of familiarity/ease of visualization, and include all three levels of familiarity/ease of visualization to fully test our moderation effect in Study 3.

Method

Three hundred and five students from University of Toronto were recruited to complete the experiment for course credit. The experiment was a 2 (temporal perspective: retrospective vs. anticipatory) x 2 (concreteness of visualization aids: abstract vs. concrete) x 3 (familiarity: low vs. moderate vs. high) between-subjects design.

Procedure. Participants were randomly assigned to one of the 12 conditions. The procedure of Study 3 is similar to that in Studies 1 and 2. Participants were asked to view an ad about a vacation destination and then relate the ad to a vacation experience they have had in the past [may have in the future].

Product Stimuli. In a pretest based on a 4-item familiarity index that included both measures for familiarity and ease of visualization (α = .91), Disney World was found to be the most familiar location venue evoking the most vivid images, Puerto Rico a moderately familiar destination, and Nepal a low familiarity option ($M_{Disney} = 7.58$ vs. $M_{PuertoRico} = 5.79$ vs. $M_{Nepal} = 3.79$; $F(1, 52) = 28.84, p < .001$ on nine-point scales; see Web Appendix A). Participants in the main study thus viewed an ad of one of these three vacation destinations, which consisted of a picture and a short verbal message. Similar to the stimuli used by Krishnamurthy and Sujan (1999), we varied the level of concreteness of the visualization aids by providing participants with either pictures with a high level of contextual detail or pictures with less detail (see Web Appendix C for pictures). Again, the pre-test confirmed that participants perceived the ads with
detailed pictures to be more concrete than the ads with less detailed pictures ($M_{Abstract} = 3.41$ vs. $M_{Concrete} = 4.37$; $F(1, 51) = 4.98, p < .05$; see Web Appendix A).

Measures. After participants performed the visualization task they completed the measurement instrument. We adopted the measures in Krishnamurthy and Sujan (1999) and utilized a 4-item index of evaluation: what their overall evaluation of the vacation destination is based on two scales (1 = bad; 9 = good, and 1 = negative; 9 = positive); how they would rate this vacation destination (1= poor; 9 = excellent); and how attractive they find this destination (1=not at all; 9 = very attractive). To directly test the process shown in Krishnamurthy and Sujan (1999), we measured the interference between participants’ own mental images and the information in the ad, utilizing three 9-point scale items (Krishnamurthy and Sujan 1999): “The ad was inconsistent with my thoughts”; “I thought about a vacation experience dissimilar to what was shown in the ad;” and “I found it easy to integrate my thoughts with the surroundings and activates shown in the ad.”

As manipulation checks for concreteness, participants rated how detailed they found the ad for the vacation destination. To capture participants’ familiarity with the vacation destination, we first asked how familiar they were with this travel destination and how familiar they were with similar travel destinations. Then, to incorporate the related ease of visualization of the destinations and test the correlation between familiarity and ease of visualization, we also asked participant to indicate their agreement with two statements: “I can easily form a visual image of what it is like to use this product” and “I can visualize what it is like to use this product” (adopted and modified based on Petrova and Cialdini 2005). All questions were based on 9-point scales.
Results

*Manipulation checks.* Consistent with the pretest results, a 2 (temporal perspective) x 2 (visualization aids) x 3 (familiarity) ANOVA showed only a significant main effect of concreteness of visualization aids on the detail rating ($M_{abstract} = 3.86$ vs. $M_{concrete} = 4.56$; $F(1, 293) = 11.61, p = .01$), a significant main effect of familiarity on participants’ self-reported familiarity with the vacation destinations ($\alpha = .77$; $M_{high} = 7.21$ vs. $M_{moderate} = 5.41$ vs. $M_{low} = 3.26$; $F(2, 293) = 129.42, p < .001$), and a significant main effect for the perceived ease of visualization ($\alpha = .94$; $M_{high} = 7.28$ vs. $M_{moderate} = 6.86$ vs. $M_{low} = 5.06$; $F(2, 293) = 45.00, p < .001$). These findings confirmed that our manipulations of concreteness and familiarity were successful. Further analysis showed that the familiarity measure and ease measure are highly correlated ($r = .54$), confirming our assumption that familiarity is indeed a precursor for ease of visualization.

*Product evaluation.* The four product evaluation questions were aggregated into a product evaluation index ($\alpha = .88$). A 2 (temporal perspective) x 2 (visualization aids) x 3 (familiarity) ANOVA showed a significant three-way interaction ($F(2, 293) = 8.06, p < .001$; see Figure 3). No other main effects or 2-way interactions were significant except for the main effect of familiarity ($F(2, 293) = 32.80, p < .001$).

When the vacation destination was highly familiar and very easy to visualize, we observed no main effect of temporal perspective ($F(1, 98) = .57, p = .45$) or visualization aids ($F(1, 98) = .13, p = .72$), but a significant interaction between temporal perspective and visualization aids ($F(1, 98) = 9.87, p < .005$). Consistent with prior research (Krishnamurthy and Sujan 1999) and H3b, for retrospective visualization, abstract aids led to higher evaluations than concrete aids ($M_{abstract} = 7.68$ vs. $M_{concrete} = 6.69$; $F(1, 98) = 6.05, p < .05$), whereas for anticipatory
visualization, concrete aids led to higher evaluations ($M_{\text{concrete}} = 7.36$ vs. $M_{\text{abstract}} = 6.58$; $F(1, 98) = 3.92, p < .05$). These results replicated the interference-based effect shown in prior research when people naturally had numerous detailed mental images about an event.

When the vacation destination was moderately familiar and relatively easy to visualize, we again observed no main effect of temporal perspective ($F(1, 107) = .08, p = .78$) or visualization aids ($F(1, 107) = .06, p = .80$), but a significant interaction between temporal perspective and visualization aids ($F(1, 107) = 9.14, p < .005$). Consistent with H1, planned contrasts showed a reversed pattern from that of the highly familiar product described above: For retrospective visualization, concrete aids led to higher evaluations than abstract aids ($M_{\text{concrete}} = 7.55$ vs. $M_{\text{abstract}} = 6.91; p < .05; F(1, 107) = 3.89, p = .05$), whereas for anticipatory visualization, abstract aids led to higher evaluations ($M_{\text{abstract}} = 7.54$ vs. $M_{\text{concrete}} = 6.78; F(1, 107) = 5.29, p < .05$).

When the vacation destination was highly unfamiliar and very difficult to visualize, we found no main effect of temporal perspective ($F(1, 88) = 1.26, p = .26$), visualization aids ($F(1, 88) = 2.50, p = .18$), or interaction effects ($F(1, 88) = .95, p = .33$). Consistent with the findings in Study 2 and H3a, for those unfamiliar participants, we didn’t find a difference between abstract and concrete aids for evaluation when participants related the vacation to the past ($M_{\text{abstract}} = 5.80$ vs. $M_{\text{concrete}} = 6.00; F(1, 88) = .20, p = .66$), whereas for anticipatory visualization, abstract aids led to marginally higher evaluations ($M_{\text{abstract}} = 5.95$ vs. $M_{\text{concrete}} 5.09; F(1, 88) = 3.08, p = .08$).

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Insert Figure 3 about here
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Mediating role of interference: To assess the role of interference we conducted separate mediation analyses based on the potential mediator of the 3-item interference measure ($\alpha = .66$) for the overall data and for each level of familiarity. The results showed that interference only mediated the interaction between temporal perspective and concreteness for the highly familiar conditions (95% CI: .0342 to .8682), but not in the moderate or low familiarity conditions (see Web Appendix B for details).

Discussion

Study 3 manipulated three levels of familiarity/ease of visualization and demonstrated that product familiarity and the related ease of visualization moderates the effect of construal match on product evaluation, providing support for H$_1$ and H$_3$. Specifically, for those who had some familiarity with the vacation destination and thus found it moderately easy to visualize the vacation, the match of the concreteness between temporal perspective and visualization aids (i.e., detailed aids for retrospective visualization and abstract aids for anticipatory visualization) increased product evaluations.

For people who were highly unfamiliar with the vacation and thus had little prior experience to support their visualization, patterns were attenuated: the type of aids didn’t matter under retrospective orientation, and concrete aids led to more positive evaluations than abstract aids under an anticipatory orientation. These results fully replicated our findings in Study 2. For a highly familiar vacation that was very easy to visualize, we replicated findings in prior research (Krishnamurthy and Sujan 1999) and showed a reversal of the effect of match between visualization and temporal focus: It was the abstract aids for retrospective visualization or concrete aids for anticipatory visualization that led to increased evaluations. Further, consistent
with Krishnamurthy and Sujan (1999), interference was shown to mediate the interaction for the highly familiar vacation product; however, it did not operate for moderately familiar or highly unfamiliar vacations.

Taken together, results of Study 3 supported our hypotheses. Further, the usage of a vacation package as the product category confirmed that our identified effect does not just hold for utilitarian product such as a Tablet PC; it also applies to hedonic products such as vacations. Lastly, the unique manipulation of concreteness in Study 3 based on picture details demonstrated that concreteness doesn’t have to always focus on the process of how to use a product.

**STUDY 4**

In Study 4, we further examine the moderating role of ease of visualization in consumer’s new product evaluation from a different perspective. Specifically, in accordance with prior research that shows that adding non-experiential product information undermines the effect of imagery (Petrova and Cialdini 2005), we manipulate ease of visualization by emphasizing the product features that are either relatively easy or hard to visualize. We predict that the effect of the mindset match on new product evaluation will be realized for a new product framed as relatively easy to visualize and attenuated for the same product when framed in a manner that makes it difficult to visualize. In Study 4 we further validate the extent of imagery processing construct by expanding our measures to incorporate clarity (Petrova and Cialdini 2005) and self-referencing (Krishnamurthy and Sujan 1999).

Method
Two hundred and twenty-three students at University of Toronto were recruited to complete the study for an exchange of $5. The experiment was a 2 (temporal perspective: retrospective vs. anticipatory) x 2 (concreteness of visualization aids: abstract vs. concrete) x 2 (ease of visualization via positioning: relatively easy vs. relatively hard) between-subjects design.

Procedure. Participants were randomly assigned to one of the eight conditions. The procedure of Study 4 was similar to the first three studies, except for the manipulation of ease of visualization (operationalized via product positioning). Participants first examined the product information of the product under development (at the time of the study) by Google called Google Glass. They were then asked to imagine using the Google Glass in a past or future scenario, and received visualization aids of different levels of concreteness.

All participants evaluated a mock advertisement of the Google Glass in our study. Similar to previous studies, the mock advertisement consisted of the headline, the picture, and a short description of the product. In both the easy and hard conditions, the innovative Google Glass were presented as a sleek electronic device that can project data (such as weather, maps and email) and take photos every 10 seconds automatically (see Web Appendix C). However, these functions were emphasized to different extents in different conditions, and the visualization aids participants received also varied accordingly.

**When visualization was relatively hard.** In this condition, the headline stated “Google Glass: Access Your Information Anytime!” The product picture showed a consumer wearing the Google Glass and accessing information regarding the subway schedule, a map, and the weather. The short description beneath the picture emphasized the favorite feature of this innovation to be “the ability of the glasses to project data (such as weather, maps, email, chat) into the user's field of vision on a small screen above the right eye. This allows you to have access to all of your
“information anytime, anywhere, without disrupting your regular activities!” We then instructed participants to take a moment to imagine using the new Google Glass in a past or future scenario where they were/are otherwise unable to access their information conveniently. We further provided a sample activity. In the abstract conditions, the example contained no details and was rather general as below (tense was adjusted in the past conditions):

- “For example, you could think about reading an important text or email hands free while having lunch in the campus cafeteria.”

In the concrete conditions, we added more details to the same example.

- “For example, you could think about reading an important text or email hands free while having lunch in the campus cafeteria. Imagine you were eating during class break in the cafeteria, and were notified of an incoming text or email by the Google Glass. You glimpsed at the right corner of the glasses and casually read the information without distracting yourself from your meal.”

When visualization was relatively easy. In this condition, the headline stated “Google Glass: Capture Your Happy Memories!” The product picture showed the same consumer wearing the Google Glass and viewing shots of a party, a concert, and a vacation. The short description beneath the picture emphasized the favorite feature of this innovation to be “the tiny embedded camera that has a time-lapse capability enabling photos to be taken every 10 seconds automatically. This allows you to capture important memories and fun experiences all the time without disrupting the exciting moments you are experiencing.” We then instructed participants to take a moment to imagine using the new Google Glass in a past or future scenario where they were/are otherwise unable to record the event smoothly. We further provided a sample activity. In the abstract conditions, we provided a general example as below (note that tense was adjusted in the past conditions):

- “For example, you could think about recording all the fun moments from a great party at your friend’s place hands free while enjoying the party.”
In the concrete conditions, we added more details to the same example.

- “For example, you could think about recording all the fun moments from a great party at your friend’s place hands free while enjoying the party. Imagine walking through the party crowd, chatting with different friends, and having the Google Glass take snapshots of your friends dancing and laughing at the party. You could record these unscripted memories without distracting yourself from enjoying the party.”

A pretest confirmed that participants rated the ad emphasizing the picture function to be relatively easier to visualize than the ad emphasizing the email/text function (Ms = 7.27 vs. 6.38, F (1, 50) = 5.40, p < .05). Further, a separate pretest confirmed that the concrete sample activity was perceived as significantly more concrete than the abstract one, regardless of whether the picture or email/text function was emphasized (Ms = 7.14 vs. 4.52, F (1, 86) = 53.17, p < .001; see Web Appendix A for details for both pretests).

Measures. After participants performed their visualization based on the instructions and described their mental images, they proceeded to the key dependent variables. We captured participants’ overall evaluation of the product using the same four-item measures as those in the first two studies. To broaden our measure of extent of imagery processing and to stay close to related prior literature, we adopted measures from previous research (Krishnamurthy and Sujan 1999; Petrova and Cialdini 2005) in assessing this construct. Specifically, in addition to the two items we used in studies 1 and 2 (how much they used visualization and to what extent they envisioned the scenario during the visualization task), we also asked participants to indicate how clear their mental images were, to what extent they linked themselves to the advertised product, and to what extent their thoughts were consistent with the descriptions of the product. All items were based on nine-point scales (1 = “Not at all”, 9 = “very much”).
Results

Product evaluation. The four product evaluation questions were aggregated into a product evaluation index ($\alpha = .92$). A 2 (temporal perspective) x 2 (visualization aids) x 2 (ease of visualization) ANOVA showed no main effects or two-way interactions, but a significant three-way interaction ($F(1, 215) = 4.60, p < .05$; see Figure 4), supporting $H_{3a}$ and suggesting that the match of concreteness between temporal construal and visualization aids worked differently depending on how the product was positioned. When the new product was positioned as relatively easy to visualize (i.e., emphasizing the automatic photo-taking functions), consistent with our hypothesis and findings in Studies 1 – 3, we found a significant interaction between time and visualization aids ($F(1, 107) = 6.13, p < .05$). Follow-up contrasts showed that when participants were asked to relate the product to the future, abstract visualization aids led to marginally higher product evaluations than concrete visualization aids: ($M_{\text{abstract}} = 5.87$ vs. $M_{\text{concrete}} = 5.04; F(1, 107) = 2.98, p = .08$). When participants were asked to relate the product to the past, concrete visualization aids led to marginally higher product evaluations ($M_{\text{concrete}} = 5.77$ vs. $M_{\text{abstract}} = 4.91; F(1, 107) = 3.14, p = .07$).

When the new product was positioned as relatively hard to visualize (i.e., emphasizing the weather, map, and email functions), we found no interaction between time and visualization aids ($F(1, 108) = .43, p = .52$). The effect of visualization aids did not differ regardless of whether the visualization was prospective ($M_{\text{abstract}} = 5.09$ vs. $M_{\text{concrete}} = 5.16; F(1, 108) = .02, p = .90$) or retrospective ($M_{\text{concrete}} = 5.02$ vs. $M_{\text{abstract}} = 5.44; F(1, 108) = .62, p = .43$).

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Insert Figure 4 about here
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Mediation analysis for extent of imagery processing: The expanded 5-item extent of imagery processing measures were aggregated to create an extent of imagery processing index (α = .78). Regression analysis showed a significant three-way interaction of temporal perspective, visualization aids and ease of visualization on extent of imagery processing (b = 1.53, t(215) = 2.18, p < .05). Further, bootstrap analysis confirmed that extent of imagery processing fully mediated the effect of temporal perspective, visualization aids, and ease of visualization on product evaluations (95% CI: .1350 to 1.5681, change of three-way interaction in significance after controlling for the mediator: b = 1.45, t(214) = 1.49, p = .14 vs. b = 2.17, t(215) = 2.14, p < .05; see Web Appendix B for details).

Discussion

Study 4 further demonstrated that ease of visualization moderates the effect of construal match on product evaluation and provides additional support for H3a. While Studies 2 and 3 manipulated ease of visualization via product familiarity, Study 4 manipulated ease of visualization via product positioning. Using the same new product, we emphasized functions that were either easier or harder to visualize, and found that the match of construal levels worked when the product was positioned to be relatively easy to visualize, but not when it is was positioned as hard to visualize. Specifically, when the new product was presented as an innovative and sleek device to take automatic pictures (which could elicit easier visualization), the match of the construal level between temporal perspective and visualization aids facilitated the extent of imagery processing and improved product evaluations. As a result, more detailed visualization aids led to higher product evaluations when the visualization was retrospective, and abstract aids enhanced new product evaluations when the visualization was anticipatory. When
the new product was framed as an innovative and sleek device to check maps or emails on the go (which was harder to visualize), this pattern was attenuated and the match between time and the type of aids no longer mattered. It is important to note that even if the features of sending emails or checking maps might be similar for Google Glass in this study and the Tablet PC in Study 1, pairing these typical computer features with glasses is significantly more innovative and harder to imagine than pairing these same features with a Tablet PC. Therefore, we observed the match effect for the Tablet, but not for Google Glass even though they shared some parallel features.

**GENERAL DISCUSSION**

This research contributes to recent work on visualization and new product learning (e.g., Castano et al. 2008; Hoeffler 2003; Zhao et al. 2009, 2011) by examining the benefit of the match between visualization aids and a retrospective versus anticipatory temporal perspective on new product evaluation, identifying the extent of imagery processing as the underlying mechanism, and demonstrating the moderating role of ease of visualization/product familiarity. We first summarize the empirical results and discuss how these findings contribute to existing literature before identifying possibilities for future investigation.

**Summary of Findings**

In Study 1 we demonstrate that when visualization encouraged retrospection (where people naturally think concretely), providing concrete visualization aids led to more positive evaluations. However, when the visualization was anticipation-oriented (which naturally evokes more abstract thinking), detailed aids lost their advantage and it was the abstract visualization aids that led to higher evaluations. In Studies 2 - 4, we show the moderating role of ease of visualization.
The effect of the match between visualization aid and temporal perspective on increased product evaluation was realized only when it was moderately easy for participants to visualize the new products. That is, when people were somewhat familiar with the new product and had prior knowledge to draw from for their visualization or when the product descriptions emphasized visualizable features they were shown to be successful. In situations where it was very hard to visualize (i.e., when they lacked necessary prior knowledge and visualization content due to low category familiarity or when the product features were hard to visualize), the mindset match-based effect was attenuated. Further, we showed a reversal of the match effect when the product was highly familiar and very easy to visualize. In this instance people had detailed product images and too much visualization content from their own memory which created interference in the visualization task, consistent with prior findings (i.e., Krishnamurthy and Sujan 1999).

The mediation analyses across our studies confirmed that the match of the construal levels between the temporal perspective and visualization aids led to greater imagery processing, which in turn increased evaluations, except in Study 3 when a highly familiar product was evaluated (which supported the interference account). Finally, extent of imagery processing was measured in multiple ways. In Studies 1 and 2, two measures of extent of imagery were captured and they were shown to partially mediate the interaction effect identified. In Study 4, a broader measure was used (Krishnamurthy and Sujan 1999; Petrova and Cialdini 2005) and the extent of imagery processing construct was found to fully mediate the results.

Contributions

Our results contribute to several research domains. First, contrary to conventional wisdom that more information or more detailed information is always better (Keller and McGill 1994;
Kisielius and Sternthal 1984; Petty and Cacioppo 1984), in the new product context we study, our results show that this is only true when consumer visualization specific to the product is retrospective. Note that a series of pre-tests were performed (in general terms and with each of the stimuli used in our studies), where we asked participants which type and what amount of information they felt would be more valuable when making the different types of choices that were put forth (see Web Appendix A). In all cases consumers predict that detailed information (and more usage examples) would be more beneficial to them. Yet, in four studies, we demonstrate that although consumers believe they want more detailed information about new products, this intuition backfires when they visualize future product usages. Counter to people’s intuition, visualization aids led to more positive new product evaluations only when the concreteness of the aids matched the mindset associated with the temporal frame. The one exception was when consumer had very little familiarity with the new product. In that case, preliminary evidence indicates they did benefit from the concrete aids when thinking about the future time period.

When visualization is anticipatory, which is the default temporal perspective most consumers take while evaluating new products, more detailed information was shown to actually lower product evaluations. As such, our findings add to the consumer misforecasting literature that has previously focused primarily on the domain of affective experience (Frederick and Loewenstein 1999; Kahneman and Snell 1990). The finding that more is not always better extends existing research that has shown that too much guidance might constrain consumers and lead to suboptimal outcomes (e.g., part-list cueing, Alba and Chattopadhyay 1985; Dahl and Moreau 2007; Soman and Zhao 2011). By identifying the benefit of the match between visualization aids and a retrospective versus prospective temporal mindset on new product
evaluation, our findings add to research that has explored the notion of “fit” between mindset and message (e.g., Higgins 2000; Petrova and Cialdini 2005; Thompson and Hamilton 2006) by extending it in the new product domain and by identifying the moderating role of ease of visualization.

Our research also contributes to recent work investigating the role of visualization in new product learning. The majority of studies in the visualization literature have shown that looking into the future is more beneficial than relying on past memories (e.g., Zhao et al. 2009), even though some research in non-new-product related domains have indicated a positive effect of memory on product evaluation (e.g., Burnkrant and Unnava 1995; Debevec and Romeo 1992; Kumar and Krishnan 2004; Sujan et al. 1993). Our work builds on these findings by demonstrating the positive role of retrospective visualization in the new product domain. Further, we broadened the identified effect of matching process- or outcome-focused visualization (Castano et al. 2008) by examining the role of abstract vs. concrete promotional aids, which increased the generalizability and value of visualization in new product learning.

Finally, our work provides potential reconciliation to contradictory findings in the literature. While Castano et al. (2008) demonstrated a match effect for new product evaluation, Krishnamurthy and Sujan (1999) showed interference effects in a similar context. Our work shows that familiarity and the ease of visualization are key moderators that can reconcile these different findings. Indeed, when a product is highly familiar and very easy to visualize (e.g., a highly familiar vacation destination), the autobiographical memories retrieved can interfere with visualization aids (Krishnamurthy and Sujan 1999). In contrast, when the focal products is novel such as in the context in Castano et al. (2008) (and in our research), visualization aids that match the consumer perspective facilitate effective product evaluations.
Limitation and Future Research

In this research we examined the effect of visualization aids and temporal frame on new products with different levels of familiarity/ease of visualization. Our central focus was on new products that are relatively unfamiliar to the consumer (as highly familiar product would typically not be a new product), and the empirical studies employed (i.e., Studies 1, 2, and 4) centered on these products. The one exception was found in Study 3 where we also utilized a product with a high level of familiarity/ease of visualization. The inclusion of all three levels of familiarity/ease of visualization in Study 3 was important as it offered a clearer familiarity/ease benchmark whereas Studies 2 and 4 focused on products with moderate or low ease of visualization only. While the familiarity/ease scores in studies 2 and 4 might seem different from each other, comparing means across different studies would not be appropriate since such comparison lacks random assignment and different studies were conducted at different times. Future research might seek to further examine products that are highly familiar to consumers and their corresponding new products at different levels of lower familiarity. Further, we showed the extent of imagery processing to be the underlying mechanism for new products with moderate familiarity (Studies 1, 2 and 4), and interference as the process underlying the effects for highly familiar products (Study 3). We did not test the relative strength of these two mechanisms. Our conjecture is that when there are too many existing mental images, interference will inhibit the consumer’s ability to truly engage in new imagery processing, thus diminishing evaluations. Future research could examine the interplay of these two mechanisms.

Our work offers other future research opportunities. We showed in our work that retrospective visualization can be helpful in evaluating new products if it is paired with detailed
visualization aids. Given that this temporal perspective is largely neglected in the new product domain, future work could examine other approaches to elicit the positive effect of a retrospective temporal focus in new product evaluation. Indeed, what other options are available in spurring consumers to draw upon their memories when faced with a new product? Perhaps previous literature in analogical processing and new product learning (e.g., Gregan-Paxton and Moreau 2003) can be leveraged here. Future research could examine whether retrospective imagery provides effective analogies that facilitate new product evaluation.

Further, while the matching effect identified in our research is independent from process-vs. outcome-focused visualization (Castano et al. 2008), it would be an interesting future research question to examine how abstract vs. concrete information and a process vs. outcome focus would interact with one another in impacting product evaluation. For example, will detailed process-focused information and abstract outcome-focused information be more effective in product evaluation? Or vice versa? And in what contexts would these types of pairings be most efficacious? While beyond the scope of the current investigation this question raises interesting future research possibilities.

In addition, in our work, we examined an immediate matching effect of visualization aids and temporal perspective in new product evaluation. How long will this effect endure? Will the match also lead to higher satisfaction after purchase (Thompson, Hamilton and Petrova 2009)? If enhanced visualization allows consumers to better predict the utility that they might derive from the purchase of the product, then enhanced post purchase satisfaction would be predicted. Future research should examine the downstream implications of the effects identified in this initial work.
FIGURE 1: STUDY 1 RESULT

Temporal Orientation x Visualization Aids Interaction

![Bar Chart]

- Concrete visualization aids
- Abstract visualization aids

<table>
<thead>
<tr>
<th>Visualization Type</th>
<th>New Product Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrospective visualization</td>
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</tr>
<tr>
<td>Anticipatory visualization</td>
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</tr>
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<td>Abstract visualization aids</td>
<td>6.28</td>
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<tr>
<td>Concrete visualization aids</td>
<td>6.86</td>
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FIGURE 2: STUDY 2 RESULTS

Temporal Orientation x Visualization Aids x Ease of Visualization Interaction

Relatively easy to visualize (Participants with moderate category familiarity)

![Graph showing New Product Evaluation scores for Concrete and Abstract visualization aids across Retrospective and Anticipatory visualization for the relatively easy to visualize condition.](image1)

Relatively hard to visualize (Participants with low category familiarity)

![Graph showing New Product Evaluation scores for Concrete and Abstract visualization aids across Retrospective and Anticipatory visualization for the relatively hard to visualize condition.](image2)
FIGURE 3: STUDY 3 RESULTS

Temporal Orientation x Visualization Aids x Ease of Visualization Interaction

Very high ease of visualization/familiarity

Moderate ease of visualization/familiarity

Very low ease of visualization/familiarity
FIGURE 4: STUDY 4 RESULTS
Temporal Orientation x Visualization Aids x Ease of Visualization Interaction

Relatively easy to visualize (Product descriptions emphasizing picture functions)

![Graph showing ease of visualization](image)

Relatively hard to visualize (Product descriptions emphasizing information functions)

![Graph showing ease of visualization](image)
The third author supervised the collection of data for the first and second studies by research assistants at Vanderbilt University in fall 2009 and fall 2010, respectively. The first author supervised the collection of data for the third and fourth studies by research assistants at University of Toronto in fall 2013 and spring 2013, respectively. These data were analyzed jointly by all three authors.
REFERENCES


Markman, W., Klein, and S. Shur (Eds.), *The Handbook of Imagination and Mental Simulation*.


Headings List

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   2) The Moderating Influence of Ease of Visualization
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