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Consumer Processing of Interior Service Environments: The Interplay Among Visual Complexity, Processing Fluency, and Attractiveness

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Abstract

Visual appeal is an important consideration in the design of interior service environments because attractiveness influences consumer behavior. Employing both an experiment and a field study, we show that visual complexity reduces a service environment's attractiveness. Furthermore, we find that the complexity-attractiveness relationship is mediated by processing fluency and its instantaneous affective companion, pleasure. Our findings provide novel insights into the underlying process mechanism involved in channeling the effect of visual complexity on attractiveness. Furthermore, both studies confirm that customers' field dependence moderates the complexity-fluency relationship and that shopping motivation (i.e., hedonic vs. utilitarian shopping goals) moderates the fluency-pleasure relationship. Our findings suggest that it is generally better to reduce the complexity of interior service environments. To achieve this, service firms should reduce the number of objects in the environment, enhance the visual organization and symmetry of their arrangement, and use fewer colors, textures, and materials.

Keywords

interior design, complexity, affect, processing fluency, field dependence, shopping motivation

Introduction

Visual design is an important consideration in the creation of a service environment (Orth, Heinrich, and Malkewitz 2012), with a key objective of increasing its attractiveness (Bitner 1992; Grewal et al. 2003). Attractive interiors have several positive outcomes: They capture attention (McGill and Anand 1989), evoke excitement and a desire to stay (Wakefield and Baker 1998), generate liking (Leder and Carbon 2005), trigger approach behaviors (Chitturi, Raghunathan, and Mahajan 2008), enhance the visitor experience (Verhoef et al. 2009), support positioning (Baker, Grewal, and Parasuraman 1994), strengthen consumer attachment (Chitturi, Raghunathan, and Mahajan 2008), and, perhaps most important, positively influence consumer purchase decisions and loyalty (Baker et al. 2002). Although the establishment of a deep relationship with a store or a servicescape hinges on extended experiences and the development of meaning and emotion (Verhoef et al. 2009), this relationship begins with the initial experience with the interior, an area in which design plays an important role.

Research in metacognition theory has shown that a key driver of attractiveness is how fluently people process a stimulus (Cho and Schwarz 2010). Processing fluency is the subjective experience of the ease and speed with which an incoming stimulus is processed (Reber, Winkielman, and Schwarz 1998). Processing fluency is also an important source of information for people, as they monitor the ease and speed with which they can extract meaning from a stimulus (Schwarz 2004). It is typically a cue to previous experience and indicates that the stimulus is likely to be benign (Winkielman et al. 2006). As such, the fluency signal is hedonically marked, such that high fluency elicits a positive affective reaction (Reber, Schwarz, and Winkielman 2004). While people lack insight into the cause of this positive reaction, they misattribute the fluency to the stimulus and associate more fluent stimuli with greater attractiveness (Schwarz 2004).

Among the characteristics that drive processing fluency, visual complexity plays an important role (Creusen, Veryzer, and Schoormans 2010). Visual complexity is determined by factors such as the irregularity, detail, dissimilarity, and quantity of objects; the asymmetry and irregularity of their arrangement (Kent and Allen 1994; Pieters, Wedel, and Batra 2010); and the variations in color and contrast (Leder and Carbon 2005).

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In service environments, visual complexity refers to the design of walls, floors, ceilings, furniture, and fixtures (Orth, Heinrich, and Malkewitz 2012); the density and layout of the floor space (Yildirim and Akalin-Baskaja 2007); and the variety of assortments presented (Hoch, Bradlow, and Wansink 1999). Despite these findings, significant gaps remain in the theoretical understanding of how consumers process and respond to visual complexity in a service environment, which is the focus of our study.

This study makes three contributions. First, this study shows that visual complexity of a service environment influences its perceived attractiveness. Second, it offers novel insights into the underlying mechanism of processing fluency (and its affective companion, pleasure) as a process mediator. Specifically, we show that fluency mediates the impact of visual complexity on attractiveness. Third, this study examines one individual variable (i.e., a shopper's field dependence/independence) and one situational variable (i.e., hedonic vs. utilitarian shopping goal) that could potentially moderate our hypothesized effects. These two characteristics present possible boundary conditions for determining when effects may be enhanced or muted.

Conceptual Framework and Hypothesis Development

Visual Complexity of Service Environments

Visual complexity influences processing fluency for abstract stimuli (Reber, Winkielman, and Schwarz 1998), consumer products (e.g., Cho and Schwarz 2010; Hekkert, Snelders, and Van Wieringen 2003), package design (Orth and Malkewitz 2012), and logos (Janiszewski and Meyvis 2001), but its impact on the processing fluency of environments is not known. Because the overall positive effect of fluency on attractiveness for objects and small-scale visual stimuli is well established (e.g., Winkielman and Cacioppo 2001), we extend this perspective to service environments and suggest that low-complexity interiors facilitate processing and result in greater attractiveness and approach behaviors, particularly by increasing pleasure.

In general, perceived visual complexity increases with the quantity (Wolfe, Horowitz, and Kenner 2005) and range (Pieters, Wedel, and Zhang 2007) of objects and with the variety of colors, materials, and surface styles (Heaps and Handel 1999). The perceived complexity of an environment depends on the degree of perceptual grouping, a characteristic independent of the quantity of parts (Palmer 1999). Regularities, such as symmetry, repetition, and similarity, simplify a visual pattern (Feldman 1997; Palmer 1999; Van der Helm 2000). Similarly, textures with repetitive and uniformly oriented patterns are less complex than disorganized and cluttered ones (Heaps and Handel 1999; Oliva and Torralba 2001).

Other conceptualizations of visual complexity exist, with the Preference Framework (Kaplan, Kaplan, and Ryan 1998) perhaps being the most prominent. The Preference Framework postulates that people must fulfill two basic needs when faced with a new environment: to understand and to explore. These needs can be further differentiated along two levels of immediacy (immediate and inferred). The resulting four dimensions are complexity (immediate exploration), coherence (immediate understanding), legibility (inferred understanding), and mystery (inferred exploration).

Many studies (for a review, see Stamps 2004) have used the Preference Framework to predict individual preferences for natural environments (e.g., Kaplan, Kaplan, and Ryan 1998), manufactured scenes (e.g., Nasar, Stamps, and Hanyu 2005), and house exteriors (Akalin et al. 2009; Imamoglu 2000). Marketing researchers have employed this framework to predict preferences for color combinations (Deng, Hui, and Hutchinson 2010), websites (Rosen and Purinton 2004), and online shopping environments (Demangeot and Broderick 2010). Although our conceptualization of visual complexity parallels some of the aspects included in the Preference Framework (e.g., the aspects of richness, detail, and number of elements), we also examine the concept more broadly by integrating the literature on interior environments (i.e., Nadal et al. 2010; Oliva et al. 2004) and visual complexity in commercial stimuli (i.e., Pieters, Wedel, and Batra 2010).

Visual complexity is also sometimes used interchangeably with "clutter" (Pieters, Wedel, and Zhang 2007), despite substantial conceptual, operational, and research differences. First, clutter is conceptually different from complexity in that it is commonly equated with feature congestion in a scene (crowding) or a lack of organization (Rosenholtz, Li, and Nakano 2007). Second, research has identified clutter as a driver of visual complexity (Oliva et al. 2004; Rayner 1998). Finally, clutter studies have focused on task completion, item search, or recognition (e.g., Rosenholtz, Li, and Nakano 2007), whereas complexity research concentrates on viewer evaluation of an environment's attractiveness (Leder and Carbon 2005), processing fluency (Janiszewski and Meyvis 2001), pleasure (Im, Lennon, and Stoel 2010), and subsequent behavioral intentions (Geissler, Zinkhan, and Watson 2006).

Interior Visual Complexity and Visitor Response

Our main hypothesis predicts that the greater the visual complexity of a service environment, the lower is its attractiveness. This prediction integrates three streams of research related to the relationships between (1) complexity and attractiveness, (2) complexity and processing fluency, and (3) the effects of fluency on pleasure and subsequent attractiveness perceptions.

Optimal arousal theory (Berlyne 1971) suggests that viewer responses to visual complexity can be plotted along a continuum from low to high, with responses being the most positive when complexity falls somewhere in the middle of the continuum. However, evidence for such a bell-shaped response curve is mixed. Although some studies have verified Berlyne's (1971) predicted maximum preference for moderately complex stimuli (e.g., for house exteriors: Akalin et al. 2009; Imamoglu 2000; for artifacts: Taylor et al. 2005; for living environments: Joye 2007), others have found that preference levels change

monotonically in relation to complexity (e.g., Deng, Hui, and Hutchinson 2010; Nadal et al. 2010; Tinio and Leder 2009). Nadal et al. (2010) suggest that the unresolved relationship between complexity and attractiveness arises from differences in the conceptualization and operationalization of visual complexity, viewer motivation, and viewer response (i.e., aesthetics, attractiveness, beauty, or preference).

We do not include extreme levels of complexity in this study, so we do not expect to find an inverted U-shaped relationship between the factors of complexity and attractiveness. Specifically, we examine the affective experience of pleasure (rather than arousal) and consumer evaluations of attractiveness (i.e., appeal rather than beauty) when complexity is either moderately low or moderately high. Comparing moderate (but not extreme) levels of complexity should accurately reflect common practice, or what can reasonably be expected to be typical in service environments that generally try to avoid repelling potential customers with too extreme design factors. Given the inconclusive evidence of the relationship between complexity and attractiveness, we next review the role of processing fluency as a possible mediator.

Visual complexity is a key input for consumer information processing in service environments (Titus and Everett 2002). In nonservice contexts, several studies have linked complexity to processing fluency, positive affect (e.g., pleasure), and subsequent judgments of stimulus attractiveness (Reber, Schwarz, and Winkielman 2004). Stimuli lower in complexity are generally easier to process, leading to higher fluency (Janiszewski and Meyvis 2001; Reber, Schwarz, and Winkielman 2004). At its heart, the concept of processing fluency captures the idea that people metacognitively monitor the mental effort required to process a stimulus (Schwarz 2004). The fluent processing of a stimulus instantaneously triggers positive affect because, in humankind's evolutionary past, fluent stimuli signaled safety, an inherently preferred state (Halberstadt and Rhodes 2000; Winkielman and Cacioppo 2001). Psychophysiological methods have found fluent processing to be associated with pleasure, as reflected in the greater activity of the cheek muscle responsible for smiling (Harmon-Jones and Allen 2001). These positive reactions occur because fluency indicates error-free processing and successful identification of a stimulus and because fluency is a probabilistic cue to previous experience, indicating that the stimulus is likely to be relatively benign (Winkielman et al. 2006).

Consistent with the affect-as-information model (Schwarz and Clore 1983), the fluency hypothesis posits that positive affect (i.e., pleasure), instantly induced by a stimulus, mediates the impact of fluency on attractiveness, generating more positive judgments (Reber, Schwarz, and Winkielman 2004). When people evaluate a stimulus, they attribute the positive affect triggered by fluent processing to the stimulus and thus find it attractive (Reber, Schwarz, and Winkielman 2004).

The finding that perceptions of attractiveness owe much to the positive valence of fluent processing has been confirmed in several other contexts, including dressing rooms (Cho and Schwarz 2010), consumer products (Hekkert, Snelders, and Van Wieringen 2003), cars (Landwehr, Labroo, and Herrmann 2011), and paintings (Silvia 2005). Most relevant to the current context, Im, Lennon, and Stoel (2010) report that during a visit to a commercial website, consumers directly link pleasure to the effect of fluency, influencing their responses, including purchase and patronage intentions. Overall, the literature suggests that visual complexity hampers fluent processing and that stimuli higher in complexity are more difficult to process, thus reducing fluency and attractiveness. We advance the following hypotheses:

> **Hypothesis 1:** A service environment high in visual complexity will be perceived as less attractive than a service environment low in complexity.
>
> **Hypothesis 2:** The effect of complexity on attractiveness will be mediated by (a) processing fluency and (b) its instantaneous affective outcome, pleasure.

The downstream effects of pleasure on behavioral intentions are well established. In service contexts, positive affect is related to a variety of approach behaviors, including patronage intent (Im, Lennon, and Stoel 2010; Oliver, Rust, and Varki 1997), preference (Rosen and Purinton 2004), and approach (Eroglu, Machleit, and Davis 2003). Thus, we do not restate the hypotheses for the attractiveness-behavioral intentions link but check whether the data are consistent with previous studies.

Individual and Situational Shopping Differences

We expect the effect of visual complexity on store attractiveness to depend on individual differences (i.e., individual's field dependence; Goodenough 1987) and the shopping situation (i.e., utilitarian vs. hedonic shopping goals; Dhar and Wertenbroch 2000).

Individual field dependence/independence. Research has often operationalized people's perceptual style on a continuum of field independence/dependence (for a review, see Zhang 2004). Field dependence captures the degree to which perception is dependent on the prevalent structure of a visual field (Witkin 1950). People who are more field-dependent experience difficulties in perceiving a part as existing separately from the complex whole in which it is embedded (Choi, Koo, and Choi 2007; Goodenough 1987). Thus, they may find it difficult to discriminate between relevant and irrelevant information cues (Arthur and Day 1991). In contrast, people who are more field independent have greater cognitive disembedding skills and encounter fewer problems in discriminating relevant from irrelevant information (Goodenough 1987). Research has shown that field-independent people can more easily recognize brands in complex audiovisual fields and like the embedded brands more than field-dependent people (Matthes et al. 2011).

Adding to the concept's managerial relevance, field dependence varies across people and even over a person's life span (Panek 1985). For most people, the level of field dependence decreases from childhood to early adulthood, when the process

of increasing field dependence begins. Evidence from cross-sectional studies suggests that after people reach their late 30s, they exhibit an accelerating rate of field dependence (Eisner 1972). Furthermore, individual field dependence is susceptible to situational (Matthes et al. 2011; Zhu and Meyers-Levy 2009) and cultural (Nisbett and Miyamoto 2005) influences. Field dependence is also related to individual differences in susceptibility to social information. For example, field dependence influences customers' responses to social cues in the store environment, including their evaluation of merchandise quality, perceptions of service quality, experience of pleasure, and patronage intentions (Hu and Jasper 2006).

Taken together, this literature indicates that field dependence explains the differences in individual performance on a broad variety of visual tasks requiring perceptual disembedding. Given that field dependence captures the relative influence of an entire visual field (Witkin 1950), including the ability to separate a part from the complex whole in which it is embedded (Choi, Koo, and Choi 2007; Goodenough 1987), we also expect field dependence to affect the fluency with which people process objects in visually complex environments. Specifically, field dependence/independence should influence the individual processing of objects in visually complex contexts because this concept most closely links attention to cognition (Matthes et al. 2011). Given that field-dependent people experience more difficulty in identifying an object embedded in context, we expect a context's visual complexity to have a stronger impact on their processing fluency and evaluation of the environment's attractiveness. Therefore:

> **Hypothesis 3:** Individual field dependence will moderate the effect of high (vs. low) complexity on (a) fluency, which in turn affects (b) pleasure. Specifically, the negative effect of complexity on (a) fluency and (b) pleasure will be stronger for people who are more field dependent than field independent.

Hedonic versus utilitarian shopping goals. We propose that consumer goals moderate the impact of complexity and fluency on pleasure. Consumers enter service environments with specific goals in mind, and these goals can be arranged along a continuum ranging from the hedonic to the utilitarian (Babin, Darden, and Griffin 1994; Dhar and Wertenbroch 2000). Hedonic goals focus on the service experience itself with the objective of experiencing positive affect, such as fun and excitement (e.g., a shopping trip with friends). Conversely, utilitarian goals are predominantly instrumental or functional in nature (e.g., weekly supermarket shopping; Chitturi, Raghunathan, and Mahajan 2008).

Anything that hinders the goal attainment of task-oriented shoppers is likely to cause negative responses (Babin, Darden, and Griffith 1994). A few studies have identified consumer motives as a key driver of the differential responses to visual aspects of service environments (e.g., Bloch, Ridgway, and Dawson 1994). For example, Haytko and Baker (2004) suggest that adolescent girls' hedonic shopping motivation enhances the relationship between perceived visual aspects (atmosphere) of mall interiors and the experience. In utilitarian settings, however, cognitive effort is required when choosing a product (Mattila and Wirtz 2008). Thus, an environment that is too complex would be more likely to interfere with and hinder processing fluency than it would in a hedonic shopping situation. Therefore:

> **Hypothesis 4:** The motivation in a specific shopping situation will moderate the effect of (a) complexity and (b) its resulting fluency on pleasure. Specifically, the negative effects of (a) high (vs. low) complexity and the resulting (b) lower (higher) processing fluency on pleasure will be stronger when consumers pursue utilitarian rather than hedonic shopping goals.

Figure 1 shows the conceptual framework and its operationalization in our two studies.

Study 1: Laboratory Experiment

The purpose of Study 1 was to experimentally test the assertion that consumers will evaluate an environment as more attractive when they perceive the visual complexity of its interior as low rather than high (Hypothesis 1). The study explores the underlying mechanism by treating pleasure as an affective consequence of fluency (Hypothesis 2b). It further tests the moderating role of two variables important in capturing the individual shopping situation: field dependence (Hypothesis 3b) and hedonic versus utilitarian shopping goals (Hypothesis 4a).

Method

Study 1 was a 2 (high- vs. low-complexity service environment) × 2 (hedonic vs. utilitarian shopping goals) between-subjects experimental design. Field dependence, a personality variable that cannot be manipulated, was measured. We manipulated complexity by using two illustrative digital photos of a deli (see the Appendix). The photo for the low-complexity service environment showed a sparse interior with only a few products and packages of similar size and design, neatly arranged in regular rows and columns on minimalistic shelves. The store's ceiling, floor, and lighting were similarly plain. The high-complexity photo showed numerous and dissimilar objects arranged together in a highly irregular manner on elaborate shelves. The store also featured an ornate ceiling and floor, as well as multiple fixtures and lamps.

We designed our experimental manipulations to generate variances in visual complexity as they plausibly occur in real settings, and a pretest showed that the photos elicited the desired complexity perceptions ($N = 12$, $M_{\text{low complexity}} = 3.33$; $M_{\text{high complexity}} = 5.33$; $p = .037$). In the main study, 196 students each viewed one randomly assigned photo.

We manipulated the shopping motivation by asking participants to imagine that they were shopping at such a deli with either hedonic or utilitarian intentions (see the Appendix). Stimuli were displayed in a notebook, and participant ratings were captured electronically.

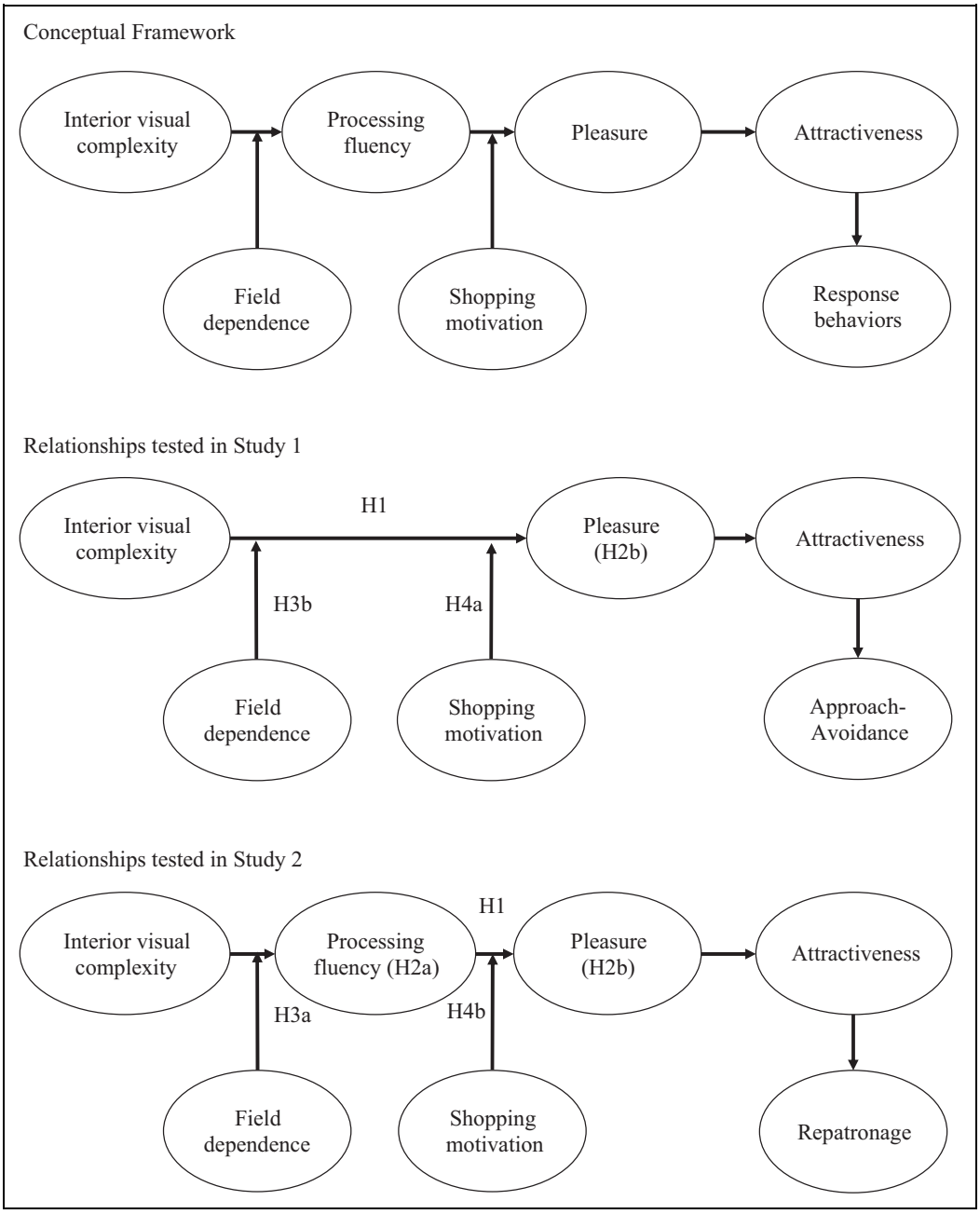

Figure 1. Conceptual framework and overview of Studies 1 and 2.
Note. Hypothesis numbers written inside a variable denote that a mediating relationship is predicted.

Measures

Psychometric measures consisted of multi-item 7-point Likert-type scales pretested and validated in previous research. Table 1 reports the scale items, factor mean scores, standard deviations (*SD*s), and Cronbach's αs.

We measured field dependence using a series of Embedded Figures Tests (EFTs; for specific details on how to administer and score EFTs, see Witkin 1950). We employed 10 EFTs for completion within a 5-minute time frame (Mumma 1993). For each EFT, participants had to identify one geometric target figure hidden within a larger and more complex pattern. A larger number of EFTs with correctly identified target figures (i.e., a maximum of 10) indicates a more field-independent style, while a smaller number (i.e., a minimum of 0) of correctly identified target figures indicates a more field-dependent cognitive style. The mean number of correctly identified EFTs was 6.08 ($SD = 1.44$).

Results

Effect of Complexity on Store Attractiveness

Hypothesis 1 predicted that a visually more (rather than less) complex environment would result in lower evaluations of

Table 1. Scale Items for Construct Measures.

Model Constructs	Study 1	Study 2
	Cronbach's α	
	M (*SD*)	
Visual complexity (Pieters, Wedel, and Batra 2010)		
• Overall, how complex does this shop environment appear to you?		
• How ambiguous is the boundary of each object in this environment?		
• How many different objects do there seem to be?		
• To what degree do there seem to be parts of the scene that are invisible?	.89	.75
• To what degree is the scene either chaotic or organized?	4.39 (.79)	4.91 (1.42)
Pleasure (Mehrabian and Russell 1974)		
• Unhappy/happy		
• Pleased/annoyed	.86	.86
• Satisfied/unsatisfied	5.09 (.90)	4.19 (.90)
Store attractiveness (Fisher 1974)		
• Unattractive/attractive		
• Low-quality products/high-quality products	.78	.86
• Low price level/high price level	5.53 (.87)	4.26 (.73)
Approach/avoidance (Mattila and Wirtz 2001)		
• I would enjoy shopping in this store		
• I like this store environment		
• I would avoid visiting this store		
• This is a place in which I would feel friendly and talkative to a stranger who happens to be next to me		
• This is a place where I would try to avoid people and avoid talking to them		
• I would like to spend time browsing in this store		
• I want to avoid looking around or exploring the store	.87	
• This is the sort of place where I end up spending more money than I originally set out to spend	5.23 (.98)	—
Repatronage intention (Wakefield and Baker 1998)		—
• I will definitely shop at the store again	—	3.89 (1.01)
Shopping motivation (Babin, Darden, and Griffin 1994)		
• The shopping trip [visit to the coffee shop] should be truly a joy		
• I would continue to shop [visit the coffee shop], not because I have to, but because I want to		
• The shopping trip [visit to the coffee shop] should truly feel like an escape		
• Compared to other things I could have done, the time spent shopping fancy food [visiting the coffee shop] would be truly enjoyable		
• I would enjoy being immersed in exciting new products		
• I would enjoy the shopping trip [visit to the coffee shop] for its own sake, not just for the items I may purchase		
• I would have a good time because I would be able to act on the "spur-of-the-moment"		
• During the trip [visit], I would feel the excitement of the hunt		
• While shopping fancy food [visiting the coffee shop], I'm able to forget my problems		
• While shopping fancy food [visiting the coffee shop], I would feel a sense of adventure		
• The shopping trip [visit to the coffee shop] would not be a very nice time out		
• I would accomplish just what I want to on the shopping trip [visit]		
• I would not buy what I really need		
• While shopping fancy food [visiting the shop], I would find just the item(s) I'm looking for	.91	.81
• I would be disappointed, if I have to go to another store [shop] to complete my shopping	3.66 (1.03)	3.41 (1.15)
Processing fluency (Landwehr, Labroo, and Herrmann 2011)		
• How easy do you find it to visually process this environment?		
• How difficult is it for you to visualize this store interior with your eyes closed?	—	.83
• How difficult would you find the task to describe this Store interior at a later point in time?		3.27 (.73)
Mood (Peterson and Sauber 1983)		
• Currently I am in a good mood		
• After seeing this store interior I feel very cheerful		
• For some reason I am not very comfortable right now	—	.90
• At this moment I feel edgy or irritable		4.31 (1.14)

Note. Adaptations of scale items made to the café context in Study 2 are shown in parentheses.

Table 2. Study 1: Testing Moderator Effects of Purchase Situation on Pleasure.

Step and Variable	*B*	*SE*	95% CI	β	R^2
Step 1					
Complexity (effects coded)	−.20	.05	[−.30, −.11]	−.30**	
Shopping motivation (z score)	.09	.06	[−.03, .22]	.10	
Field dependence (z score)	.01	.06	[−.16, .18]	.01	.11**
Step 2					
Complexity × Shopping Motivation	−.07	.02	[−.11, −.03]	−.25**	
Complexity × Field Dependence	−.11	.05	[−.21, −.01]	−.22**	.07**

Note. *SE* = standard error; CI = confidence interval.
**$p < .001$.

store attractiveness. Analysis of variance results indicated that the complexity treatments had a significant effect on attractiveness, $F(1, 194) = 14.2$, $p = .001$; participants evaluated the low-complexity environment as more attractive than the high-complexity one ($M_{\text{low complexity}} = 5.70$ vs. $M_{\text{high complexity}} = 5.19$). Thus, Hypothesis 1 is supported.

Employing two (rather than three) treatments, however, cannot capture potential dipping points in consumer response to visual complexity or produce what might be a bell-shaped response curve (Berlyne 1971). Therefore, we also used a variable of measured complexity (as an independent variable) in the analysis and found that the results were consistent. Specifically, in regressing complexity on attractiveness, we found a significant effect when assuming a linear response curve ($b = -.34$, $t = 5.09$, $R^2 = .12$). The coefficient for the linear ($b1$) but not for the quadratic ($b2$) function was significant when both were present in the regression ($b1 = -.89, b2 = -.059, R^2 = .12$). These findings suggest that using two treatment levels is appropriate.

Moderating Role of Individual Differences and Shopping Situation

Hypotheses 3b and 4a predicted that field dependence and shopping motivation would moderate the relationship between complexity and pleasure. To test this effect, or specifically the possibility of a statistically significant effect being contingent on the value of the proposed moderator, we followed the prescribed procedure of Frazier, Tix, and Barron (2004). To control for Type I errors, we entered all the moderator effects (i.e., interactions) in a single (second) step after entering the predictor (effects coded) and moderator variables on which they are based (i.e., the main effects) in the previous (first) step (Zhao, Lynch, and Chen 2010). Using the significance of the omnibus F test representing the variance explained by this entire step, we determined whether it should be eliminated from the model (if the omnibus test is not significant) or whether t-tests representing specific moderator effects should be inspected for statistical significance (Aiken and West 1991).

The results in Table 2 show that the interaction effect of complexity and field dependence on pleasure was both significant and in the expected direction ($\beta = -.22$, $t = -2.82$, $p = .007$). Thus, Hypothesis 3b is supported; the negative impact of complexity on pleasure is stronger when people are more field dependent than field independent.

The interaction effect of complexity and shopping motivation on pleasure was significant ($\beta = -.25$, $t = -3.52$, $p = .001$), in support of Hypothesis 4a. More specifically, the indirect negative effect of complexity on pleasure was stronger in a utilitarian shopping situation than in a hedonic one. However, not knowing what to buy can be unpleasant; thus, to address concerns that despite our careful pretest of scenarios, our manipulation of the hedonic shopping orientation may have induced some stress, we next used participants' subjective perceptions as independent variables in the analysis to mitigate this rival hypothesis. Repeating the analysis with the continuous motivation variable yielded results similar to those we obtained when using the dichotomous variable—namely, a significant interaction effect—suggesting no bias in our experimental manipulation.

Mediating Role of Pleasure

Hypothesis 2 posited a mediating role of processing fluency (Hypothesis 2a) and its affective consequence, pleasure (Hypothesis 2b), in the visual complexity-store attractiveness relationship. Study 1 focuses on the mediating role of pleasure (i.e., Hypothesis 2b), and Study 2 tests for the mediating role of processing fluency (i.e., Hypothesis 2a).

Employing the Statistical Package for the Social Sciences (SPSS) macro for testing simple mediation (Preacher and Hayes 2004), we found that complexity was negatively associated with pleasure, as indicated by a significant unstandardized regression coefficient ($B = -.38, t = -5.09, p = .001$). In addition, we found support for the positive relationship between pleasure and store attractiveness (controlling for complexity; $B = .51$, $t = 9.29$, $p = .001$). Furthermore, as hypothesized, complexity had an indirect negative effect on attractiveness ($B = -.27, t = -4.36, p = .001$). The formal two-tailed significance test (assuming a normal distribution) demonstrated that the indirect effect was indeed significant (Sobel's $z = -2.41$, $p = .016$). Bootstrap results confirmed the Sobel's test results, with a bootstrapped 95% confidence interval around the indirect effect not containing zero (lower limit [LL] = −.19, upper limit [UL] = −.02). Thus, pleasure mediated the effect of complexity on attractiveness, in support of Hypothesis 2b.

Finally, the study replicated prior research and confirmed that attractiveness, our key dependent variable, had a significant, positive effect on approach/avoidance ($B = .72, t = 11.54$,

$p = .001$). This result provides nomological validity while underscoring the practical relevance of our focal variable.

Discussion

The experimental findings provide initial evidence that visual complexity reduces the attractiveness of service environments, especially in a utilitarian shopping situation and when viewers are more field dependent. This pattern of results traces back to an affective response, with pleasure serving as a mediator of the complexity-attractiveness relationship.

These effects are important and significant, but the findings could be limited by the experimental nature of the study and the lack of a direct measure of processing fluency. Although previous research on the visual aspects of three-dimensional environments has successfully used two-dimensional stimuli (e.g., Heaps and Handel 1999; Nadal et al. 2010; Oliva et al. 2004; Rayner 1998), we aimed to mitigate concerns about their use by conducting a second study.

Study 2: Field Study

Method

Study 1 demonstrated the influence of visual complexity on store attractiveness, whereas the main goals of Study 2 were to investigate what drives these effects through a more detailed focus on processing fluency and to verify the robustness of the effects in a field setting and with a different sample. To accomplish these goals, we intercepted passersby who were randomly assigned (to control for favorite shop and number of visits) to 15 coffee shops.

We preselected these shops to vary in the visual complexity of their interior design. We did not group the shops (i.e., according to low, intermediate, and high visual complexity) but rather controlled for key dimensions, such as attractiveness, cleanliness, assortment variety, and price level. This approach closely follows that used in research on experimental aesthetics (Tinio and Leder 2009) in the design of brand packages (Orth and Malkewitz 2008) and logos (Henderson, Giese, and Cote 2004). Such studies combine the examination of a wider range of stimuli with a relatively smaller number of respondents per stimulus to increase variance and strengthen external validity. Therefore, while Study 1 examined individual-level responses to two interior designs (i.e., our two treatments), Study 2 explored a wider range of outlets and designs.

One hundred fifteen respondents participated in the study in exchange for a free cup of coffee at the shop. After entering the service environment, respondents completed a paper-and-pencil survey containing questions about the shop, the interior, and themselves.

Measures

The same psychometric measures were adopted as in Study 1, with the addition of another measure of processing fluency (Landwehr, Labroo, and Herrmann 2011) and adaptation of the items assessing shopping goals to the coffee shop context. Respondents also answered the same EFTs as in Study 1.

Approach/avoidance was not included in the assessment. Instead, we assessed respondents' repatronage intentions (''I will definitely shop at this store again''; Wakefield and Baker 1998). We also included mood as a covariate to guard against rival hypotheses, because mood can influence consumers' evaluation of service environments (Arnold and Reynolds 2009). Respondents reported on 3 items of the Mood Short Scale (Peterson and Sauber 1983). Mood did not have significant effects in any of the analyses, so we dropped it from our final models and do not discuss it further. The measures and reliabilities of all constructs appear in Table 1.

Results

Effects of Visual Complexity

Hypothesis 1 predicted that a store environment high rather than low in visual complexity would earn lower attractiveness ratings. Consistent with expectations, regression analysis results revealed that complexity had a significant effect on attractiveness ($\beta = -.25$, $t = -4.07$, $p = .001$), in support of Hypothesis 1. As with Study 1, regressing the complexity measure on attractiveness yielded a significant effect when assuming a linear response curve ($R^2 = .13$), whereas only the linear coefficient was significant when coefficients for both a linear and a nonlinear (inverted U shape) function were assumed ($b1 = -.30$, $b2 = -.002$, $R^2 = .13$).

We ran additional analyses when controlling for demographic variables (i.e., age and gender) indicated neither significant main effects (age: $\beta = -.14$, $t = -1.51$, $p = .13$; gender: $\beta = -.12$, $t = -1.31$, $p = .19$) nor significant interaction effects (age $\times$ complexity: $\beta = -.36$, $t = 1.35$, $p = .18$; gender $\times$ complexity: $\beta = -.13$, $t = -1.09$, $p = .28$). Further extending the initial analysis, we added a dummy variable for each store into the regressions as a control to account for any remaining variance over and above the differences in individual consumer response and perceptions for each store. The findings are identical to those of our final models. Therefore, we dropped this control variable from all further analyses. The finding that store attractiveness had a significant, positive effect on consumers' intentions to revisit the store ($\beta = .27$, $t = 6.04$, $p = .001$) adds further credence to the managerial relevance of our focal dependent construct.

Hypothesis 2a predicted that fluency, associated with pleasure (Hypothesis 2b), would mediate the effect of complexity on attractiveness. Using the SPSS macro for testing simple mediation (Preacher and Hayes 2004), we found that complexity was negatively associated with pleasure, as indicated by a significant unstandardized regression coefficient ($b = -.11$, $t = -2.71$, $p = .008$). In addition, we found a positive relationship between pleasure and store attractiveness after controlling for complexity ($b = .42$, $t = 3.13$, $p = .002$). Finally, complexity had an indirect negative effect on attractiveness ($b = -.20$, $t = -3.32$, $p = .001$), as hypothesized. A two-tailed

Table 3. Study 2: Testing Moderator Effects on Fluency and Pleasure.

Step and Variable	*B*	*SE*	95% CI	β	R^2
Effects of field dependence on fluency					
Step 1					
Complexity	−.91	.23	[−1.37, −.45]	−.35**	.12**
Field dependence (z score)	.25	.33	[−.40, .90]	.07	.07**
Step 2					
Complexity × Field Dependence	−1.01	.32	[−1.65, −38]	−.28**	
Effects of shopping motivation on pleasure					
Step 1					
Fluency	.42	.20	[.02, .83]	.19**	
Shopping motivation (z score)	.11	.42	[−.72, .94]	.02	.07**
Step 2					
Fluency × Shopping Motivation	−.96	.43	[−1.82, −.10]	−.21**	.05**

Note. *SE* = standard error; CI = confidence interval.
**$p < .001$.

significance test demonstrated that the indirect effect was significant (Sobel's $z = 1.99$, $p = .047$). Bootstrap results confirmed the Sobel's test results, with a bootstrapped 95% confidence interval around the indirect effect not containing zero (LL = −.09, UL = −.01). Thus, pleasure mediated the effect of complexity on attractiveness, in support of Hypothesis 2b.

Repeating the mediation analysis for the path from complexity to pleasure through fluency also yielded a significant effect. Specifically, complexity was negatively associated with fluency ($b = -.50$, $t = -2.71$, $p = .008$), the positive relationship between fluency and pleasure (controlling for complexity) was significant ($b = .42$, $t = 3.13$, $p = .002$), and complexity had an indirect effect on pleasure ($b = -.25$, $t = -3.32$, $p = .001$). A two-tailed significance test further confirmed that the indirect effect was significant (Sobel's $z = 2.07$, $p = .041$). Thus, fluency mediated the effect of complexity on pleasure, in support of Hypothesis 2a.

Moderating Role of Field Dependence and Shopping Situation

We predicted that field dependence would moderate the relationship between complexity and fluency (Hypothesis 3a), whereas shopping goals would moderate the relationship between fluency and pleasure (Hypothesis 4b). To test these predictions, we again followed the moderation analysis of Frazier, Tix, and Barron (2004).

Given Study 1's finding of a significant effect of field dependence on the complexity-attractiveness relationship (Hypothesis 3b), we tested for the moderating role of field dependence on the complexity-fluency relationship (Hypothesis 3a). The results (see Table 3) indicate that the Complexity × Field Dependence interaction on fluency was significant (β = −.28, $t = -3.16$, $p = .002$), in support of Hypothesis 3a. That is, the negative effect of complexity on fluency was stronger with more rather than less field-dependent people.

Table 3 also shows the results of testing the hypothesized moderating role of shopping goals (Hypothesis 4b). We predicted that utilitarian shopping goals would enhance the negative effect of complexity-induced fluency on pleasure. The findings provide support for Hypothesis 4b; the Fluency × Shopping Goal interaction was significant, and it had a significant combined effect on pleasure (β = −.21, $t = -2.22$, $p = .029$). That is, fluency had a significantly higher positive effect on pleasure for people with a utilitarian rather than a hedonic shopping motivation.

Discussion and Implications

This study has three main findings that extend understanding of the effects of visual complexity on the attractiveness of service environments. First, the findings from both Studies 1 and 2 show that high visual complexity can be detrimental to an environment's attractiveness. The two studies demonstrate this consistently, despite having different contexts and sample populations.

Second, the findings show that both processing fluency (Study 2) and the pleasure it brings (Studies 1 and 2) mediate the complexity-attractiveness relationship. This result offers an explanation for the process mechanism involved in channeling the effects of visual complexity on response behaviors. The enhanced processing fluency of visually less complex environments generates positive affect, which in turn increases attractiveness.

Third, Study 1 shows that individual and situational characteristics moderate the complexity-attractiveness relationship. Specifically, field dependence and a utilitarian shopping motivation enhance the negative effects of complexity on pleasure. In addition, the field study (Study 2) makes it clear that field dependence hinders the fluent processing of visually complex environments, while replicating the experimental finding that a utilitarian shopping motivation amplifies the negative effect of complexity on pleasure.

Theoretical Implications

This work provides several important contributions to the literature. First, the study is the first to explore the psychological

consequences of visual complexity in the context of service environments.

Second, this study incorporates the concept of processing fluency into the examination of consumer responses to service environments. With the recent exception of Sirianni et al. (2013), who investigate fluency effects related to customer evaluations of service employees and store brands, fluency research has focused almost exclusively on consumer processing of advertisements (Lee and Labroo 2004), products (Hekkert, Snelders, and Van Wieringen 2003), and packages (Orth and Malkewitz 2012), with unclear relevance for service environments. We use fluency to explain how an environment's visual complexity relates to visitor pleasure and, consequently, to evaluations of attractiveness and response behaviors. Our findings suggest that visually complex environments can be detrimental to attractiveness because of their reduced processing fluency and pleasure. Furthermore, our results suggest that the negative effects of high complexity extend to approach/avoidance and repatronage intentions.

Third, the use of fluency as a metacognition offers a theoretically grounded perspective on a visitor's experience of pleasure in the context of a service environment. An important finding in both studies is that pleasure captures positive affect related to visually less complex and more fluent interiors. While research acknowledges the central role of pleasure in a consumer's response to retail environments (e.g., Eroglu, Machleit, and Davis 2003; Oliver, Rust, and Varki 1997; Wirtz, Mattila, and Tan 2000), psychological antecedents have received less attention. Our study advocates for the role of fluency, specifically the ease and speed of information processing, as a potentially important driver.

Finally, our findings suggest that consumers respond to the visual complexity of service interiors differently depending on their perceptual style and specific shopping goals. Both studies show that the negative effects of complex environments are more pronounced for visitors who are more field dependent and when they shop with the specific purpose to buy something. These findings extend studies on how individual and situational differences influence behavior by offering a novel perspective on their impact on metacognition and the experience of affect.

Managerial Implications

Our findings should help service managers employ more effective interior designs that support their efforts to attract and retain customers. Across two contexts and samples, the results confirm that visual complexity can have a negative impact on a service environment's attractiveness.

Several avenues exist for reducing visual complexity, but they all seem to start with the variety of objects and surfaces (Oliva et al. 2004) and with organization and symmetry (Nadal et al. 2010). For example, having fewer distinct objects or elements (e.g., furniture, merchandise, displays, signs) and selecting more similar objects decrease complexity (Feldman 1997; Palmer 1999; Van der Helm 2000). Interior environments also appear less complex if objects are less variable, their spatial layout is more organized (Rayner 1998), and different parts are easy to identify and separate from each other (Oliva et al. 2004). Grouping parts (e.g., furniture, merchandise, displays) also lowers perceptions of complexity, and this effect seems to work regardless of how many actual parts there are (Palmer 1999).

Similarly, reducing the variety of colors, materials, and surface styles can decrease visual complexity (Heaps and Handel 1999). Surface textures (e.g., for floors, ceilings, and wall decoration) with repetitive and uniformly oriented patterns are perceived as less complex than disorganized and cluttered patterns (Oliva and Torralba 2001).

How visually complex a service environment should be depends greatly on the primary target segments. In line with the concept of servicescapes (Bitner 1992), environments should be designed in conformity with the expected and desired service experience (Mattila and Wirtz 2006; Wirtz, Mattila, and Tan 2000, 2007). While many outlets aim for somewhere in the middle of the visual complexity spectrum, some focus purposefully on one end of the scale. For example, Rainforest Café and Universal Studios Theme Parks lie on the high end of the complexity continuum, to engage visitors for an extended period, while Victoria Secrets outlets and spas tend to be on the low end, to provide a comfortable and relaxed atmosphere. The findings also suggest that having less complex environments is more important when visitors have largely utilitarian shopping goals (e.g., government service offices).

Finally, the findings suggest that managers should pay close attention to the individual characteristics of their customers. In this study, field dependence enhanced the negative effects of visual complexity on an environment's attractiveness. Following this, service firms should target the appropriate consumer segments and engineer their visual environment to meet the appropriate levels of visual complexity. For example, the designers of interiors catering to visitors who are in a field-dependent mode because of their culture (Nisbett and Miyamoto 2005), age (Panek 1985), or situational triggers (Zhu and Meyers-Levy 2009) should avoid designs that are visually too complex to facilitate information processing.

Limitations and Further Research

As with any research, this study raises several questions and has limitations that offer opportunities for further research. First, this study was set in deli stores and coffee shops, and thus its results may not apply to service environments in which the visual design is an important component of the value proposition to customers (e.g., museums, art galleries), in which ambient conditions are of greater relevance to overall service delivery (e.g., fine dining restaurants), or in which customers desire a service environment that involves complex servicescapes (e.g., theme parks). Further research could explore these potential boundary conditions of our findings.

Second, our examination of a single independent variable (complexity) does not account for all the variation in

attractiveness, even when two moderator variables are included. Although the results indicate substantial explanatory power of our model, researchers might find it beneficial to investigate the relative impact of complexity in relation to other design properties.

Third, assuming a linear response curve may not appropriately capture dipping points or thresholds in consumer response to visual complexity, which are better represented as bell-shaped response curves (e.g., Imamoglu 2000). Consistent with the inconclusive evidence for such response curves (Deng, Hui, and Hutchinson 2010; Nadal et al. 2010), our two studies also failed to find evidence for a nonlinear (inverted U-shaped) relationship. We speculate that this finding may have emerged because we examined typical levels of complexity found in deli shops and cafés and did not test extreme levels of low and high complexity. An inverted U shape may well emerge if more extreme levels of complexity are tested.

Finally, other conceptualizations of complexity (especially the Preference Framework; Kaplan, Kaplan, and Ryan 1998) exist. Thus, future work could examine how related dimensions (e.g., coherence, mystery) influence processing fluency and attractiveness alongside complexity.

In summary, this study provides insights into the psychological process of how the visual complexity of service environments influences response behaviors contingent on individual and situational characteristics. We hope that the contributions of this study will stimulate further research in this field.

Appendix

Study 1 Treatments

Utilitarian scenario:

"You are planning a party for your friends. You have the food you want to offer clearly in your mind. Therefore, you visit the deli store shown on the next page to buy what is on your shopping list."

Hedonic scenario:

"You are planning a party for your friends. You have no idea about the food you want to offer. Therefore, you visit the deli store shown on the next page to buy anything interesting that catches your eye."

Low-complexity environment ***High-complexity environment***

Source. Photographs by Christiane Solf.

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