

Boosting Mobile Online Purchase Intentions: The Impact of Personalized AI Driven Product Presentations Across Diverse Product Categories

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[Abstract] In an increasingly competitive mobile shopping landscape, this study explores how personalized, AI-driven product presentations influence purchase intentions. Focusing on shoes and chairs, we examine the effects of human presence, product–environment interaction, and color temperature on consumer responses. Using conjoint analysis with a linear mixed-effects model, our findings show that presentation attributes significantly shape purchase intentions and vary across product categories, underscoring the importance of category-specific strategies. This research highlights the potential of personalized presentations in e-commerce while acknowledging limitations and future directions. The insights provide practical guidance for online retailers aiming to enhance consumer engagement and conversions.

[Keywords] personalised product presentation, artificial intelligence, mobile commerce, purchase intentions.

Introduction

The rise of online shopping, specifically via mobile applications, has significantly transformed the retail landscape (Rose, Hair, & Clark, 2011). One facet of this transformation involves the increasing dominance of mobile app shopping, which throws the spotlight on the presentation of product information and how potential buyers perceive and react to the products showcased. The challenge for online retailers lies in not only presenting their wares effectively but also understanding and catering to the diverse customer base and their interactions with the product "image" (Park, Lennon, & Stoel, 2005).

In the domain of online commerce, the concept of "image" takes on a significant role, applying not only to human beings but also to products (Park, Lennon, & Stoel, 2005). This overall impression or 'image' of a product can be a driving force in shaping consumer perceptions and their subsequent decision-making process. As an example, take a commonplace coffee mug that has been on the market for years. A simple alteration in its online image — say, presenting it in a cosy reading corner accompanied by a book and a soft blanket instead of on a plain white background — can dramatically transform its image. The mug evolves from a basic utility item to a symbol of warmth and relaxation, a transformation brought on by the new image that profoundly impacts how consumers perceive the product, akin to the transformative power of product repackaging discussed by (Dichter, 1985).

This shift to image-centric product presentation is crucial in the digital marketing and communication sphere. There's a growing body of evidence to suggest that images often outperform textual content in retaining interest, invoking emotional responses, and enhancing memory retention (Pieters & Wedel, 2004; Lee, Amir, & Ariely, 2009). The immediate cognitive and emotional reactions provoked by images, thanks to their faster processing speed compared to text, form an integral part of the consumer's overall interaction with the product (Potter *et al.*,

2014). This highlights the necessity for online retailers to understand and harness the efficacy of images in attracting customer attention and securing their purchase commitment (Messaris, 1997; Palmer, Schloss, & Sammartino, 2013).

Research Questions

This forms the central focus of our research. We aim to answer the following research questions:

1. Can the product presentation affect how a customer reacts to the product on the metric that e-commerce platforms care about most, i.e., purchase intention? (Xiao & Ding, 2014)
2. If the product presentation does have an impact, how does this vary across salient features of the presentation - for instance, absence or presence of a human figure, the level of interaction between the environment and the product, and the colour temperature of the product presentation?
3. If the attributes mentioned above do have an impact, how does this impact differ across product categories - in our context, shoes, and chairs?
4. If there is indeed an impact of the product presentation, can the relative importance of these attributes be harnessed to personalize the product presentation for the customer?

These research questions stem from the increasing demand for personalized shopping experiences that go beyond the standard product displays. Our research aims to explore these questions, which are crucial in an era demanding personalized shopping experiences. Successfully answering these questions will not only enable online retailers to enhance their product presentations but also offer them actionable insights on personalizing these presentations to suit customer preferences, thus potentially leading to higher purchase intentions.

The rest of the paper is organized as follows: We first review the relevant literature. We then describe the experiment and discuss the data analysis and results. Finally, we present a discussion, the limitations, and conclusions.

Review of Literature

The review of the existing literature in this section has been divided into three main categories: Visual Aesthetics, Personalized E-commerce, and The Interplay of Image and Text in Product Presentation.

Visual Aesthetics in Online Shopping: Consumer preferences for colour, symmetry, and complexity

Research rooted in the field of Empirical Aesthetics has predominantly been aimed at understanding and predicting the universal appeal of images in a classic mass communication perspective. As we delve deeper into the digital realm, these aesthetic principles find their significance in personalized e-commerce, another prominent facet of modern online shopping. Factors such as colour and colour combinations (Schloss & Palmer, 2011), symmetry and complexity (Bauerly & Liu, 2006), and the presence or absence of humans (Cyr *et al.*, 2009) have been associated with visual appeal. For instance, individuals typically prefer cool colours and high saturation levels over warm colours and low saturation levels (Schloss & Palmer, 2011). They also favour symmetrical compositions with low-to-intermediate image complexity (Bauerly & Liu,

2008). The influence of demographic factors, such as gender, on these preferences is also evident, with men displaying a pronounced preference for saturated colours compared to women (Schloss & Palmer, 2011).

Personalized E-commerce: The Role of Technology and Product Information

With modern advancements in technology and the shift from mass communication to personalized communication (Kumar, Shah, & Venkatesan, 2006) aesthetic principles have been applied in the realm of e-commerce using machine learning methods to scrutinize image appeal at an unprecedented scale (Datta *et al.*, 2006). This shift has emphasized the need to forecast image preferences at a more individual level. The evolution of e-commerce has also amplified the importance of product presentation in influencing consumer decisions (Kim & Lennon, 2008); (Mitchell & Boustani, 1994)). As the physical evaluation of products is lacking in online environments, the role of product presentation on a website becomes crucial to customer satisfaction and purchase decisions (Hauser *et al.*, 2009; Nitse *et al.*, 2004). The product presentation helps customers to form mental images of products, fostering trust and encouraging purchasing (Dixon *et al.*, 2017).

The Interplay of Image and Text in Product Presentation: How visuals and text jointly shape user experience

In understanding the intricacies of product presentation, recent studies have focused on the effects of design elements on the online customer experience and purchasing behaviour. For example, (Bleier, Harmeling, & Palmatier, 2018) evaluated the effects of 13 unique design elements on four dimensions of the online customer experience: informativeness, entertainment, social presence, and sensory appeal. Other researchers have underlined the importance of the product's "landing page" in creating the customer's first impression, particularly on mobile devices (McDowell, Wilson & Kile, 2016) and (Beronius & Andrén, 2017).

The dynamics between image and text within these product presentations are increasingly garnering attention. There is a divide in the scholarly opinion - some propose that images may undermine the impact of text when presented together (Prasetyo *et al.*, 2017), while others argue that text descriptions are essential in aiding customer understanding when images might be misinterpreted (Khalaj & Pedgley, 2019). Studies like (Wang *et al.*, 2018) advocate for considering both image and text as integral parts of the aesthetic product presentation.

Emerging Themes and Gaps in the Literature

Despite these advances in understanding, there is a consensus that most existing studies focus on website-based shopping experiences (Hauser *et al.*, 2009). A novel area of exploration lies in the context of mobile devices and personalized appeal. For example, Matz and colleagues (Matz *et al.*, 2019) found that personalized images could predict consumer's preferences for new images and purchase intentions more accurately than general appeal. This discovery presents an avenue for further research on personalization within the mobile shopping experience.

Furthermore, there is an acknowledged gap in the understanding of how product presentations vary and impact consumer behaviour across different e-commerce categories. The understanding of the optimal product presentation for each e-commerce category remains an open

question, necessitating further exploration. In summary, while the existing literature points to the evolution of visual aesthetics from a generalized understanding to more personalized approaches, there is a clear requirement for additional research on personalized aesthetics in the context of mobile shopping and the differentiation of product presentations across various e-commerce categories.

Experimental Design Systematic Variation of Image Features Across Products

Imitating product presentations prevalent on current mobile shopping platforms, we constructed twelve unique presentations each for two product categories, 'chair' and 'shoe.' These presentations varied across the following attributes:

1. Colour Temperature: Distinguished as warm, neutral, or cold. (3 levels)
2. Interaction of Product with Environment: The extent of the product's interaction with its surroundings—for instance, a chair displayed in a living room or a shoe in an outdoor setting. (2 levels)
3. Interaction of Product with Humans: The degree of the product's interaction with humans—examples include a person wearing the sneakers or the sneakers placed on the floor. (2 levels)

These attributes were chosen due to their potential impact on consumer perception and engagement with the product, as well as their relevance to our research objectives (Cyr et al., 2009; Palmer et al.; Khattak *et al.*, 2018). We selected the categories of shoes and chairs due to their wide range of possible product presentations. Apart from colour temperature, the shoes had two environmental setups: one on a plain wooden floor, the other in an outdoor setting. They also had two human interaction scenarios: the shoe worn by a person, and the shoe kept on the ground. For the chairs, the environmental setups involved either a plain white wall or a living room, and the human interactions were represented by a chair with a human figure and a chair without. For the exact 12 images (2*2*3) used, see the appendix 1.

Experiment Procedure: A Set Up Linking Image-Based Tasks with Psychological Measures

A pretest was conducted to ensure the reliability of our survey questions, involving the distribution of an initial questionnaire to 20 individuals who are either active mobile e-commerce shoppers or intended to make a purchase on a mobile soon. Their feedback was instrumental in refining the questionnaire for the formal survey.

The data for this study was gathered through an experiment aimed at examining purchase intention for visual stimuli representing shoes and chairs presented on mobile or tablet devices. A total of 104 participants from diverse regions globally completed an online survey on the Prolific platform. Demographic information, such as gender, age, and online shopping behaviour, was also collected. The results indicated a majority of participants were female (58), with most (70%) falling within the 18-30 age range. Participants rated their likelihood of purchasing 24 different visual stimuli on a scale of 1 to 100, where 100 represents definite purchase intention, and 1 indicates definite non-purchase. After providing these ratings, participants mentioned the most and least preferred product presentation. The participants also elaborated on why they were inclined or disinclined to buy the product based on that presentation and what visual features attracted them or deterred them.

In the last section participants filled out the Rational-Experiential Inventory (REI) questionnaire. The REI questionnaire is a tool designed to understand the cognitive style of an individual, i.e., whether their thinking leaned more towards rationality or experientiality. The inclusion of this measure in our study is based on previous research (Pacini & Epstein, 1999) that highlighted the impact of cognitive style on decision-making processes, including in the context of shopping behaviour. This division into clear-cut thinking styles aimed to explore potential links between participant's purchasing decisions and their cognitive approaches, a connection that was underexplored in prior literature as identified in our literature review section. The REI questionnaire comprises 20 items that are assessed using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). These items are divided into two subscales: Rational Ability (RA) and Experiential Ability (EA). The RA subscale assesses individual's perceived capacity for logical and analytical reasoning, while the EA subscale measures their perceived ability to effectively utilize intuition.

Model

In our quest to answer the pressing research questions, a comprehensive conjoint study was conducted with 104 participants. The survey data was modelled using linear mixed-effects modelling in R's lme4 package. Before diving into the results, let us clarify why we chose the mixed-effects model. This method is advantageous as it accounts for both fixed effects and random effects and allows for the inclusion of random slopes specially when we are doing individual analysis. Even though it is possible to allow different utility specifications across individuals, we found it useful to use the same model specification (given by equation 1) and estimate models separately for everyone in the sample, as advised by (Rao, 2014) in his applied conjoint analysis.

$$Y_{ij} = \beta_{i0} + \sum_{r=1}^p \sum_{q=1}^{Q_r} \beta_{irq} D_{rq} \quad (1)$$

Here, in equation (1), we use β_{irq} parameters to develop the part-worth functions for each respondent. 'r' is the number of attributes and Q_r are the levels for each attribute excluding the reference category, D_{rq} are the dummy variables for the attributes mentioned above. Notably, we also considered the interactions of the attributes as each image in our study is an interaction of the attributes we are considering.

Empirical Results

To effectively communicate the results, we present them as response to the four research questions.

Aggregate Analysis: Measuring overall effects of presentation features on purchase intention

- 1) Can the product presentation affect how a customer reacts to the product on the metric that e-commerce platforms care about most, i.e., purchase intention?

- 2) If the product presentation does have an impact, how does this vary across salient features of the presentation - for instance, absence or presence of a human figure, the level of interaction between the environment and the product, and the colour temperature of the product presentation?
- 3) If the attributes mentioned above do have an impact, how does this impact differ across product categories - in our context, shoes, and chairs?
- 4) If there is indeed an impact of the product presentation, can the relative importance of these attributes be harnessed to personalize the product presentation for the customer?

Our analysis at the aggregate level does indeed show that the attributes of a product presentation significantly impact customer's purchase intention. For example, our model indicates that the presence of a human element in the presentation had a significant negative effect (-6.9038, $p < 0.05$) on purchase intention. Examining the attributes in more detail, we found a high environment effect had a significant positive effect (3.0625, $p < 0.05$) on purchase intention compared to a low environment effect. Furthermore, neutral, and warm colour temperatures were significantly positive compared to a cold colour temperature (10.2163, and 5.1298, respectively, all $p < 0.05$). This suggests that on average, customers would give higher purchase intentions to presentations with neutral or warm colour temperatures compared to the cold one. An intriguing finding emerged from the analysis, indicating that when the product presentation involved human interaction with a neutral colour temperature, the average purchase intention decreased (-4.9471). This is noteworthy considering that a neutral colour temperature alone had a significant positive effect on purchase intention. This suggests that the interaction between these two variables influenced consumers' perceptions and decision-making processes in a way that differed from the individual effects of each variable alone. The model explains 46.9% of the variance in the data and has a root mean squared error (RMSE) of 18.5, demonstrating a moderate level of prediction accuracy.

Category Analysis: Comparing Presentation Effects Across Chairs and Shoes

When we considered the data for each product category separately, we found fascinating results. For chairs, the presence of a human had a significant negative effect (-12.6058). Conversely, the environment effect and neutral colour temperature, had significant positive effects (10.4712 and 13.2500, respectively). Our model for chairs had an R-squared value of 0.695 indicating that it explains 69.5% of the variance in the data.

For shoes, the presence of a human element in the presentation had a non-significant negative effect (-1.2019). Interestingly, the high environment effect had a negative impact on shoe preference (-4.3462). Conversely, neutral, and warm colour temperatures had significant positive effects (7.1827 and 6.6058, respectively) as compared to the cold colour temperatures. Our shoe model had an R-squared value of 69.4%. We further validated our analysis using the text responses provided by the participants.

A pattern emerged from our analysis, showing a particular preference for chair images that were presented within a living room setting. This suggests that participants appreciated the ability to visualize how the chair would fit and look within a realistic context, enabling them to imagine its aesthetics within their own living spaces. Fascinatingly, there was a noticeable tendency among participants to favour chair images that did not include a human figure. This may imply that the

presence of a human in the image might have diverted their focus from the chair itself. Participants, it seems, preferred to dedicate their attention solely to the evaluation of the chair's design, features, and suitability for their own personal preferences.

Simultaneously, the analysis for the shoe category revealed a different pattern of preferences. We found contrasting patterns in terms of variation and consistency in participant responses across the two product categories. The shoe category elicited more diverse and subjective responses, which indicates a higher level of individual preference and variability. In contrast, the chair category demonstrated a more convergent pattern, suggesting a shared understanding or preference for a specific chair image among participants.

In terms of preference distribution, Figures 1 and 2 below illustrate the popularity of different chair and shoe images among participants. For shoes, the variation in ratings makes it challenging to determine a clear standout image that received the highest rating. In contrast, the chair category shows a higher level of consistency, with a clear winner emerging as the image that received the highest ratings.

Figure 1

Counts of Different Images of Chair



Figure 2

Counts of Different Images of Shoe

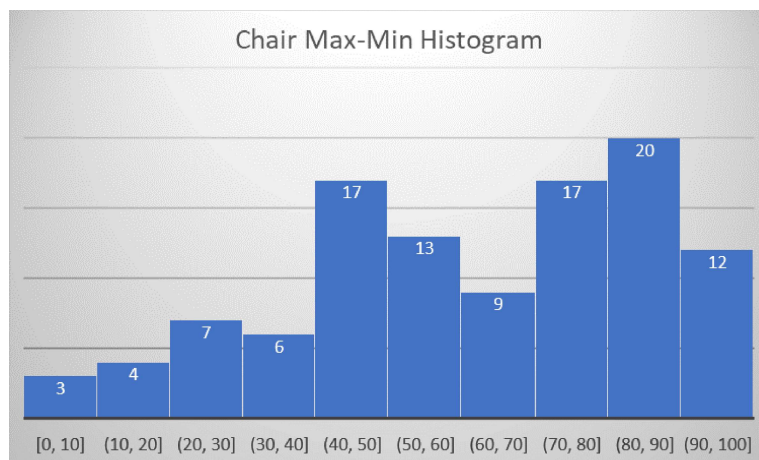


Individual Analysis: Personalising Images Based on Individual-Level Impact

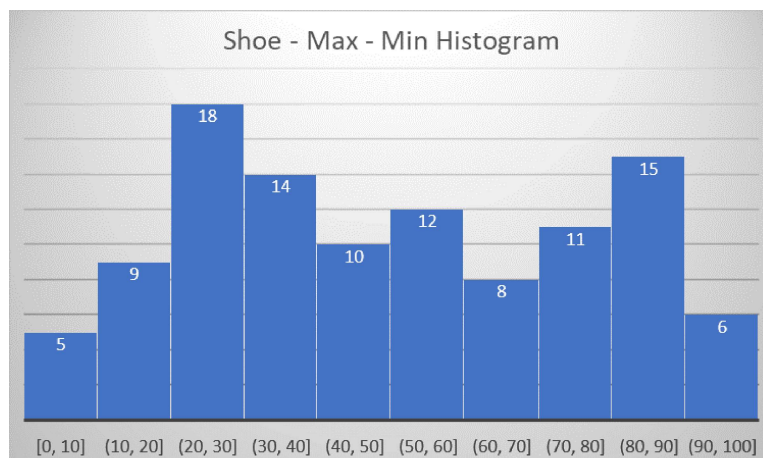
To calculate the relative importance of these attributes and their influence on customer's purchase intentions, as shown in Figures 3 and 4, we computed the percentage improvement by calculating the difference between the highest and the lowest purchase intention of each consumer for each image across categories. As depicted in graphs, the result was non-trivial. In the case of chairs, most of the participants lie in the 80-90% band of improvement, and almost similar for the case of shoes. It is worth noting that while the majority of participants did not fall within the 80-90% range of improvement in their purchase intention ratings, the next highest proportion of participants did. This indicates that a significant number of individuals demonstrated a notable increase in their purchase intention after evaluating the product presentations. Hence these results imply that the impact of showing the right image to the right customer significantly impacts their purchase intention.

Figure 3

Percentage Improvement in PI for Chair

**Figure 4**

Percentage Improvement in PI for shoe



Also as highlighted in our models, variances in attribute effects are considerable. Higher variance values denote a broader spectrum of effects across individuals, suggesting diverse reactions, while lower variance values point towards more uniform responses. For instance, in the case of shoes, the variance of the presence or absence of a human is 194.4, implying that the difference in impact on Purchase Intention (PI) due to the presence of a human in the presentation compared to its absence can fluctuate by around 13-14 units across individuals. Contrastingly, in the chair category, this variance narrows down to 16-17 units, marking a significant difference.

An intriguing observation arises in the context of the 'environment effect' for chairs, where the variance value for a high environmental effect registers at 75.81. This lower variance indicates a more consistent impact of a high environmental effect on PI, meaning the responses to different levels of environmental effect in the chair presentations are more homogeneous among participants. Thus, consumer's reactions to the environmental effect in chair presentations demonstrate more consistency and likeness, illuminating an intriguing facet of consumer behaviour.

Lastly, before drawing our conclusions, it is important to highlight the predictive accuracy of our model. To assess our model's performance, we used a holdout sample consisting of 4 images, which resulted in a Root Mean Squared Error (RMSE) of 18.2. For comparison, the benchmark model, which assigned all images the same rating as the most popular image, had a higher RMSE of 26.79. These figures underscore the improved performance of the mixed effects model in capturing the heterogeneity in preferences, further attesting to the validity of our approach. Taken together, these findings underscore the importance of considering individual differences when designing product presentations. By harnessing the variability in customer responses to different product presentation attributes, e-commerce platforms can potentially personalize product presentations to enhance customer purchase intentions. Personalized product presentations, therefore, offer a promising avenue for enhancing customer purchase intentions.

The variability in the effect of these attributes across customers and categories suggests that a "one-size-fits-all" approach to product presentations may be insufficient. Instead, these results highlight the potential benefits of personalizing product presentations to the specific preferences of individual customers and product categories.

In the current analysis, we did not find a significant relationship between consumer's thinking style and attributes of the product presentation. While there were some instances where rational individuals rated shoe images with human presence higher, these findings were not statistically significant. However, this perspective holds potential for further exploration by conducting segment analysis based on thinking styles allows for a better understanding of how consumers perceive product presentations, which in turn influences their purchase intention.

Discussion: Understanding When and How Image Features Matter

Our findings shed light on how different attributes of product presentations influence consumer preferences and purchase intentions. It underscores the need for considering both individual preferences and the product category when designing product presentations. Furthermore, the results accentuate the potential advantages of personalizing product presentations to enhance purchase intentions.

In the category of chairs, consumers gravitated towards images devoid of a human figure. Arguably, a chair unoccupied allows a more transparent appraisal of its design and functionality.

Concurrently, chairs framed with a pronounced environmental effect and neutral colour temperature sparked favourable responses. This could be because such attributes may enhance a chair's perceived comfort and versatility in different settings. In contrast, the shoe category exhibited differing preferences. The presence or absence of a human element did not notably sway shoe preference. However, an intensified environmental setting seemed to distract from the product's appeal. A plausible interpretation could be that a high environmental setting obscures product details, thus diminishing its appeal. Interestingly, this negative perception was counteracted when the environmental effect coincided with a human figure, which induced a significantly positive response. This interaction might provide a context that assists consumers in appreciating the shoe's design or visualizing its appearance when worn. Neutral or warm colour temperature, similarly, augmented shoe appeal.

The results further highlight an interesting dichotomy in consumer behaviour across product categories. Chairs, typically perceived as lifestyle products, garnered more consistent responses. Conversely, shoes, as personal items intimately tied to an individual's identity, invoked more varied consumer behaviour. This difference indicates that personalization strategies might require tailoring according to the product category.

Our analysis illuminated the notable role of variance values in understanding consumer preferences, which was particularly salient when considering personalizing product presentations. Variance values, indicating the diversity of responses for each attribute, underscore the complex landscape of consumer responses. For instance, the lower variance for the environmental effect in chairs pointed towards more uniform reactions, whereas the varying standard deviations for the same image underscored substantial heterogeneity among participants. This divergence demonstrates how individual perception and interpretation of the same image can lead to differing purchase intentions, revealing the richness of consumer behaviour and preferences.

Limitations and Future Work

First, our research was restricted by a smaller sample size, potentially limiting the applicability of our findings to a broader demographic. Future investigations should consider collecting larger datasets, utilizing machine learning techniques to provide more robust and generalizable insights. In our future analysis, we could also employ a Hierarchical Bayesian (HB) model. This modelling approach is particularly advantageous when dealing with limited sample sizes and scenarios involving interactions of variables. The HB model is expected to provide more accurate estimates and improve the overall performance of our analysis by effectively capturing the complexities inherent in the data. Another advantage of using the HB model is its ability to incorporate an additional level of covariates. By including these covariates, the HB model can provide deeper insights into the underlying relationships between independent variables and outcome variable. Second, our study analysed only two product categories, chairs, and shoes.

Consequently, our results may not translate accurately to other product categories, such as electronics or food items. The application of our research methodology across a more diverse range of products would undoubtedly augment our understanding of consumer preferences and personalization. Third, we limited our focus to three image attributes - the presence of a human, environmental effect, and colour temperature. We acknowledge that various factors could sway consumer preferences, including image quality, viewing angles, product design, brand reputation,

and pricing. We suggest future researchers to control for these variables. Fourth, our reliance on self-reported data introduces the possibility of response bias or inaccuracies, as participant's recall of their preferences may not always be accurate or truthful.

Moreover, our study only captures a snapshot of consumer preferences, which are prone to change over time. As a direction for future research, the implementation of longitudinal studies that can track these changes would add valuable depth to our understanding of consumer preferences. As part of future work, we aim to conduct segment analysis to explore potential relationships between consumers' thinking styles – rational vs experiential and their decision-making processes when purchasing products based on specific product presentations. We plan to investigate the underlying mechanisms using a latent class multivariate regression model, as proposed by Ramaswamy et al. (1993). The latent class multivariate regression model will allow us to simultaneously analyse the dependent variable, in our case – the purchase intention, while accounting for the potential heterogeneity within the consumer population.

In this study, our analysis did not reveal a significant relationship between consumer's thinking styles and their decision-making processes. However, we acknowledge that by incorporating a broader range of attributes, bigger samples and employing alternative analytical approaches, we may uncover significant results.

Conclusion: Summary of Findings and Implications for Personalized Presentation

To briefly respond to our research objectives, the investigation has yielded significant insights. Firstly, we found that product presentation indeed impacts purchase intention, confirming prior research on the visual aesthetics in marketing. Secondly, salient features of the presentation, including the presence or absence of a human figure, the interaction level between the environment and the product, and the colour temperature of the product presentation, all significantly influenced purchase intentions. Our third research question was addressed as well, revealing that these impacts do differ across product categories, specifically shoes and chairs in our context, confirming the importance of product-category specificity.

Lastly, this study has indeed demonstrated that understanding the relative importance of these attributes can guide strategies for personalizing product presentations for customers, opening up new opportunities in e-commerce strategies. This study is the first attempt to highlight the impact of personalizing product presentations in enhancing purchase intentions. It enriches the theoretical framework surrounding online product presentation and consumer preference. By highlighting how specific image attributes interact with product category differences to shape consumer preferences, our study adds depth to the existing understanding of these dynamics. The findings draw attention to the potential of personalized product presentations, highlighting the role of image attributes in driving consumer responses, thereby enriching the existing literature in this domain.

The implications of this study are paramount for e-commerce retailers, particularly those operating on mobile platforms. The findings provide a roadmap for retailers to tailor their product presentations according to customer expectations, enhancing customer engagement and potentially boosting sales. The study illustrates the power of personalized product presentations, suggesting they could be instrumental in providing competitive differentiation in the bustling online marketplace. However, as highlighted, due to the variability in consumer responses, there are

challenges in implementation, urging retailers to continually refine their strategies based on customer feedback and ongoing research.

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Appendix 1

Images of the shoe



S1



S2



S3



S4



S5



S6



S7



S8



S9



S10



S11



S12

Images Of the Chair



C1



C2



C3



C4



C5



C6



C7



C8



C9



C10



C11



C12