

Article

Relationship Between Visual Marketing Elements and Consumer Satisfaction

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Abstract: With the rapid expansion of online shopping, website design has become a critical factor influencing user experience and consumer satisfaction. This study examines the relationship between visual marketing elements embedded in e-commerce web page design and consumer satisfaction by analyzing 1500 product pages across five major categories (furniture, small items, food, home appliances, and clothing) on the Japanese platform Rakuten. The analysis reveals that in the furniture category, a higher proportion of images featuring visible faces and video explanations demonstrated positive correlations with consumer satisfaction. For food products, text color diversity demonstrated positive correlations with consumer satisfaction. In the home appliance category, text color and video explanations showed positive correlations with satisfaction, while the number of human images and video music showed negative correlations. For accessory products, images positioned at the website periphery, the number of human images, and video music showed negative correlations with consumer satisfaction. In the apparel category, text color and the number of human images demonstrated negative correlations with consumer satisfaction. However, in the analysis of the entire sample, no significant correlations were observed between visual marketing elements and consumer satisfaction. These findings suggest that visual marketing strategies should be tailored to specific product categories, which may contribute to improving consumer satisfaction with e-commerce platforms.



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Keywords: online shopping; visual marketing; consumer satisfaction; website design

1. Introduction

In the current e-commerce environment, online shopping platforms have gradually become a primary mode of shopping, particularly in the post-COVID-19 era [1]. With technological advancement, online shopping has evolved to become predominantly mobile based, increasingly integrating into people's daily lives [2]. Furthermore, with the development of internet technology and the growing demand for convenience and diversity, e-commerce platforms have rapidly evolved to become a primary shopping channel for consumers [3,4]. Compared to traditional brick-and-mortar stores, e-commerce platforms attract more consumers by offering a wider product selection, more convenient shopping experiences, and often lower prices. The growth of e-commerce platforms is driven by the expansion of the online marketplace [5]. With the rapid growth of the e-commerce market and online shopping demand, these platforms now provide 24 h nationwide shopping services, meeting consumers' diversified needs [6].

In the context of e-commerce, visual marketing—referring to the use of visual elements to attract and guide consumers’ attention and thereby influencing their purchasing behavior and decision-making—has become crucial for the success of online platforms. In recent years, with the comprehensive advancement of digital transformation and continuous technological innovation, visual marketing strategies and consumer experiences on e-commerce platforms have evolved continuously. While research indicates that traditional visual elements such as color, layout, images, and animations play a vital role in enhancing user experience, promoting sales [7], and strengthening brand image and consumer loyalty [8], recent studies underscore the pivotal role of visual marketing in shaping consumer behavior. Hu and Liu (2021) developed an e-commerce platform leveraging big data to tailor product design services based on user characteristics, thereby optimizing performance [9]. Meanwhile, digital innovations have led firms to adopt animations and emojis. However, Bashirzadeh et al. (2022) found that while these elements improve information richness individually, their combined use may trigger information chaos, adversely affecting behaviors such as unsubscriptions and in-app dwell time [10]. In contrast, Marwan et al. (2022) demonstrated that high-quality visuals, UGC, and influencer endorsements boost product appeal and trust, guiding more effective visual marketing strategies [11]. These studies emphasize the significant role of visual elements as an integral component of marketing in influencing consumer behavior.

The web page design framework plays a significant role in visual marketing and is one of the main means of implementing visual marketing strategies. Excellent web design can enhance visual appeal and improve user experience through rational layout and aesthetic design [12]. For instance, the choice of background color can influence users’ emotional responses [13]. The quality and relevance of images can enhance information transmission effectiveness, animations can improve users’ interactive experiences, and the use of human images can strengthen consumers’ trust [14,15]. Research suggests that an effective combination of visual elements can significantly improve the attractiveness of web pages and user satisfaction [16]. Furthermore, multimedia elements such as images and videos can provide more intuitive and vivid product displays, enhancing users’ sense of participation and trust [17]. Typography and layout in web design are also crucial; good information architecture allows users to navigate website content smoothly, improving user retention and conversion rates [18].

Unlike traditional offline transactions, e-commerce platforms offer consumers the opportunity to shop online at any time, and consumer behavior is evolving in response to societal changes [19,20]. However, this digital transformation brings unique challenges. Unlike physical stores where consumers can interact directly with products, online shoppers face uncertainty and information asymmetry, which can lead to dissatisfaction and cart abandonment. A key challenge for e-commerce platforms is the “experience gap”, which refers to consumers’ inability to physically inspect products before purchase. While traditional retail environments naturally engage multiple senses, online platforms must primarily rely on visual elements to compensate for this sensory limitation. This limitation underscores the urgent need to understand how visual marketing elements can bridge this experience gap and reduce purchase uncertainty. Although the importance of visual elements is acknowledged [7,9,13], current research has not adequately addressed how specific visual marketing components contribute to overcoming the fundamental challenges of online shopping. Previous studies have mainly focused on broad website design principles rather than exploring the precise mechanisms by which visual elements can compensate for the lack of physical interaction. As consumers’ expectations for online shopping experiences continue to evolve, this gap is particularly concerning, necessitating more

sophisticated visual solutions to reduce purchase uncertainty and enhance satisfaction. Therefore, this study poses the following research question:

RQ: What is the relationship between visual marketing elements of web design in e-commerce platforms and consumer satisfaction?

This research aims to provide a detailed understanding of how website design can offer consumers better shopping experiences and improve satisfaction. It also seeks to fill the research gap regarding the impact of specific visual marketing elements on consumer behavior [21]. By understanding and applying visual marketing strategies, businesses can better meet consumer needs, enhance user experience, and ultimately increase consumer satisfaction. Thus, the objective of this study is to identify which design elements of e-commerce platforms, from a visual marketing perspective, enhance consumers' shopping satisfaction.

This study analyzed visual marketing from four aspects: background, product images, human images, and videos. Based on a systematic review of the existing literature (e.g., [13,16,22–24]), we identified that images, colors, human portraits, and videos may have direct and significant impacts on consumer attention, emotional experience, and information communication in e-commerce web page design. These four dimensions theoretically constitute the core elements of visual marketing, and their importance has been repeatedly validated through empirical research. Moreover, these four elements demonstrate quantifiability and relative ease of statistical analysis during the actual data collection and analysis.

This study used the Rakuten shopping platform as the research subject. We collected data on 1500 products across five categories (furniture, food, electronics, accessories, and apparel), using product ratings as a proxy for consumer satisfaction to analyze the relationship between visual marketing elements and consumer satisfaction. This study selected the Rakuten platform in Japan as its research context. According to Rakuten's official website (<https://www.rakuten.co.jp/ec/sellinjapan/>, accessed at 16 February 2025), Japan possesses advanced digital infrastructure and a mature e-commerce market, providing a unique and representative context for investigating how visual marketing elements influence consumer satisfaction. Within the Japanese market, Rakuten, as the world's fourth-largest online shopping platform, accounts for approximately 28.9% of Japan's online shopping market share. Furthermore, the Rakuten platform offers high design flexibility in web page construction, enabling a comprehensive examination of various visual element applications. The results revealed varying correlations between visual elements and satisfaction across different product categories, providing new insights into visual marketing theory and web design for e-commerce platforms.

2. Literature Review and Hypothesis Development

This section first introduces the development of e-commerce platforms and web page design. Next, it explains the importance of visual marketing and its related elements. Subsequently, we construct hypotheses regarding the relationship between visual marketing and consumer satisfaction from four perspectives: background, product images, human images, and videos.

2.1. Online Shopping Platforms

The evolution of e-commerce platforms has seen a remarkable progression from simple electronic commerce sites to complex, multifunctional platforms. Initially, shopping sites primarily displayed products through static web pages, with consumers completing orders via phone or email [25]. As internet technology advanced, online payment systems and security protocols were established, enabling shopping sites to introduce features such as shopping carts, user accounts, and real-time inventory management, significantly enhanc-

ing user experience [26]. Technological advancements, coupled with the proliferation of social media and mobile devices, further propelled e-commerce development. Platforms integrated social sharing features, personalized recommendation systems, and mobile applications, allowing consumers to shop anytime and anywhere [27]. In recent years, the application of emerging technologies such as live commerce and virtual reality shopping has injected new vitality into e-commerce, not only enriching the shopping experience but also strengthening consumer interaction and the sense of participation [28].

Throughout the development of e-commerce platforms, web design research has been a crucial area for improving user experience and satisfaction. Early research primarily focused on website navigation structure and information architecture, emphasizing clear interfaces and user-friendly functionalities [29]. As technology evolved, research gradually delved deeper into the aesthetic design and interactivity of user interfaces. Rosen and Purinton (2004) demonstrated that well-designed websites could significantly enhance user experience and increase consumer purchase intention and satisfaction [30]. Rational navigation structures, clear product displays, and fast loading speeds are crucial elements for improving user experience. Szymanski and Hise (2000) further pointed out that user-friendly interface design and personalized shopping experiences could significantly enhance consumer satisfaction and strengthen brand loyalty [31]. Research has also shown that consumer satisfaction is a critical factor influencing repeat purchase behavior, revealing that web design optimization is an effective strategy for improving consumer satisfaction.

As e-commerce platforms have evolved, consumer behavior has also changed significantly. Hong, Thong, and Tam (2004) studied the evolution of online shopping behavior and found that consumers' decision-making processes in online environments differ markedly from traditional shopping environments [20]. Online shopping allows consumers to easily compare different products and prices, enabling more rational purchase decisions. Szymanski and Hise's (2000) research showed that when choosing shopping sites, consumers increasingly value site convenience and user experience, in addition to price and product variety [31]. Kim and Peterson's (2017) study further indicated that personalized recommendation systems and user-friendly interface designs could significantly improve consumer satisfaction and loyalty [27]. These studies demonstrate that as e-commerce platforms advance, consumer behavior and expectations are constantly changing, suggesting that businesses need to continuously optimize their website design and functionality to meet consumer needs and enhance satisfaction.

2.2. Visual Marketing

Visual marketing is a marketing strategy that communicates information visually and shapes consumer emotions and brand image [32]. It focuses on utilizing visual elements such as color, images, shapes, and layouts to stimulate potential consumers' purchase intentions and enhance brand awareness [33]. Successful implementation of this strategy requires a deep understanding of the target audience's aesthetic preferences, cultural background, and purchasing habits to create more attractive and need-specific visuals [34].

Consumer perception and sensory experience significantly impact the effectiveness of visual marketing. When consumers perceive products or brands, they first encounter visual elements such as brand logos, packaging designs, and advertising promotions [15]. These elements directly influence attitudes and behaviors towards products and brands [35]. In particular, when consumers see visuals that resonate with their own values and lifestyles, they are more likely to develop familiarity and trust in that brand [36]. Therefore, it is crucial to understand consumer perception mechanisms and design visual elements that align with consumer needs and preferences [37].

Visual marketing plays a vital role in e-commerce as well. The impact of e-commerce platform design on consumer shopping experiences cannot be ignored, and visual marketing strategies play a crucial role in e-commerce design [38]. Through meticulous design and layout, e-commerce platforms can effectively enhance user experience and brand image [39]. Visual marketing in e-commerce design can increase user attention and attraction [40]. By utilizing visual elements such as colors, images, and fonts, user interest can be directed towards important products or campaigns, increasing click-through rates and purchase intentions [41].

Furthermore, visual marketing can enhance e-commerce brand image and user perception [42]. As important brand display platforms, shopping sites can convey core brand values and images through skillful visual design [43]. Utilizing visuals can increase brand favorability and trust, leading consumers to choose products and services offered by the e-commerce platform [35]. In particular, the consistency and credibility of the brand perceived by consumers are reinforced through visual elements [36].

Effective interface design through visual marketing can also improve the usability and user satisfaction of e-commerce platforms [44]. Excellent page layout and navigation design help users quickly find needed products, reducing search time and operational complexity, thereby improving user satisfaction and shopping experience [40]. The application of visual elements provides users with more intuitive and understandable shopping guides, enabling a smoother and more enjoyable experience throughout the shopping process [45].

Thus, there is a close relationship between e-commerce design and visual marketing, with mutual influences determining the success of e-commerce platforms [46]. Analyzing these relationships can provide valuable guidance and references for shopping site design and visual marketing practices.

2.3. Hypothesis Development

According to Manganari, Siomkos, and Vrechopoulos's (2009) research on e-commerce site design elements, web page design elements can be categorized into three main aspects: visual design, information design, and interaction design [47]. Based on the characteristics of e-commerce sites, this study further subdivides the visual design elements of web pages into image, color, and video settings. These elements can create strong empathy with consumers by appealing to their emotions and values [22,48]. This study focuses on four main visual marketing elements in online shopping sites: image elements, color elements, human images, and video elements. These elements are considered to potentially have significant impacts on consumers' shopping experience and satisfaction. Therefore, hypotheses are constructed for the following four parts.

2.3.1. Visual Marketing Element 1: Image Elements

In e-commerce, product images, as the primary visual element of user-brand interaction, are closely related to consumer shopping experience and satisfaction. Web page design includes multiple visual elements such as layout, color, and images [49]. Among these, images play a crucial role in forming the overall visual effects and user experience [12]. The number of product images, the number of similar product images, and images on the periphery of web pages not only reflect commonly used visual processing methods in web page design but also correspond to three important aspects of visual marketing: information richness, comparison convenience, and attention guidance [22,50,51].

First, from the perspective of the number of product images, we examine their relationship with consumer satisfaction through multiple theoretical lenses. The cognitive load theory suggests that properly presented multiple product images can reduce the mental effort in processing product information, leading to enhanced decision-making

confidence [52]. Previous studies have shown that sufficient visual information allows consumers to comprehensively understand product characteristics [53]. The virtual experience theory provides another perspective, suggesting that multi-angle product images simulate the physical store verification process, thereby enhancing the online shopping experience [24,28]. This simulation helps consumers better understand the product, potentially reducing the gap between expectations and actual product experience. Recent research in digital marketing has demonstrated that increasing the number of product images positively influences consumers' attitudes towards products [7]. The multiple product images help bridge the gap between online and offline shopping experiences by providing comprehensive product information from different angles and contexts. Suh and Chang (2006) also showed that abundant product visual information increases consumers' product knowledge [54]. These factors may affect satisfaction by allowing consumers to understand products in more detail and increasing the consistency between expectations and actual products. Therefore, based on these theoretical frameworks and empirical evidence, we propose the following research hypothesis:

H1: *In online shopping sites, there is a positive correlation between the number of product images and consumer satisfaction.*

Next, we examine the relationship between the use of similar product images and consumer satisfaction through multiple theoretical lenses. At the core of this relationship lies the choice overload theory, which suggests that excessive options can lead to decision paralysis and decreased satisfaction [55]. Previous research has shown that an increase in options causes difficulty in decision-making and regret [56]. Building upon this foundation, in online shopping, it has been revealed that an increase in product options raises consumers' cognitive load [52,57]. Chernev (2003) showed that the more there are of comparisons of similar products, the less confident consumers tend to be in their choices [58]. Furthermore, Diehl and Poynor's (2010) research revealed that presenting many options raises consumer expectations [59]. These cognitive limitations further manifest in consumers' decision confidence and expectations, creating a psychological tension that can significantly impact satisfaction levels. The interaction between reduced confidence and elevated expectations may lead to a substantial gap between anticipated and actual product experiences. These factors may affect satisfaction by complicating the consumer decision-making process and reducing their confidence in choices. Therefore, integrating these theoretical perspectives and their interconnected effects on consumer psychology, we propose the following research hypothesis:

H2: *In online shopping sites, there is a positive correlation between the decrease in the number of images of similar other products and the increase in consumer satisfaction.*

Lastly, we examine the relationship between peripheral web page images and consumer satisfaction through multiple theoretical lenses. The visual attention theory provides our foundational perspective, suggesting that peripheral visual elements can significantly impact cognitive processing and user experience [60]. Previous research suggests that interfering elements on web pages affect user experience and task completion efficiency [20]. It has also been shown that excessive peripheral images can be perceived as intrusive advertisements, evoking negative emotions in users [61]. These cognitive and emotional effects are further amplified by website complexity, as Nadkarni and Gupta's (2007) research revealed that the more visually complex a website is, the more it affects user experience [62]. Burke et al. (2005) also demonstrated that visual clutter in online shopping environments distracts consumers' attention [63]. The information processing theory suggests that these combined effects create cognitive overload, leading to decreased information processing efficiency and negative emotional responses [64]. This interaction between cognitive load

and emotional responses can substantially impact the overall shopping experience. Therefore, integrating these theoretical perspectives on visual attention, cognitive processing, and user experience, we propose the following research hypothesis:

H3: *In online shopping sites, there is a positive correlation between the decrease in the use of images on the periphery of web pages and the improvement in consumer satisfaction.*

2.3.2. Visual Marketing Element 2: Color Elements

In e-commerce, color is a crucial visual element in user–brand interaction, significantly influencing the consumer shopping experience and satisfaction. In web page design, color plays an essential role in forming the overall visual effects and user experience [12]. The image background color and text color not only reflect commonly used color processing methods in web page design but also correspond to important aspects of visual marketing such as visual complexity, information hierarchy, and brand identity [65,66].

First, we examined the relationship between color schemes and consumer satisfaction from multiple theoretical perspectives. The Color-in-Context Theory provides our theoretical foundation, suggesting that visually complex web designs burden users’ information processing abilities and extend task completion time [67]. Images with diverse background colors may make it difficult for consumers to focus on product information and decrease web page dwell time [68]. The impact of color schemes extends beyond mere visual processing to affect user trust and brand perception. Research shows that website color design directly influences users’ sense of trust [16]. Images with single or unified background colors may reduce visual interference and improve the readability of product information [69]. Supporting this view, studies have demonstrated that consistent color schemes strengthen the image of brand reliability and expertise [70]. However, the relationship between color complexity and user experience requires careful balance. Recent research emphasizes the importance of balancing website aesthetic appeal and usability [14], as excessively diverse background colors may disrupt this equilibrium. Empirical evidence from Lurie and Mason (2007) reveals that reducing visual complexity significantly improves user browsing efficiency and decision-making processes [71]. These findings collectively suggest that when there are many images with diverse background colors, consumers may not be able to efficiently find necessary information, increasing the time needed for purchase decisions and potentially lowering overall satisfaction. Therefore, integrating these perspectives on visual complexity, color psychology, and user experience, we propose the following research hypothesis:

H4: *In online shopping sites, there is a positive correlation between the increase in the proportion of images with a single background color (decrease in the proportion of images with multiple background colors) and the improvement in consumer satisfaction.*

Secondly, we examined the relationship between text color diversity and consumer satisfaction from multiple theoretical perspectives. The digital typography and color psychology suggest that an appropriate contrast between text and background significantly improves information readability and processing efficiency, enabling consumers to more effectively recognize product descriptions and price information [72]. Building upon these cognitive processing principles, research demonstrates that strategic variations in text color can establish visual hierarchies and emphasize key information [73]. The impact extends beyond mere readability to brand perception, as studies show that when text color choices align with brand visual identity, brand recognition and recall are significantly enhanced [66]. From a psychological perspective, color psychology research reveals that specific colors evoke particular emotions and impressions [13]. This emotional connection is particularly relevant in e-commerce contexts, where Jin et al. (2019) found that appropriate color

usage effectively conveys product attributes and brand personalities [74]. Furthermore, Dzulkifli and Mustafar (2013) demonstrated that strategic text color implementation can reduce cognitive load while increasing information retention and processing depth [75]. These cognitive and emotional effects collectively contribute to an enhanced user experience, as text color diversity allows consumers to process information more efficiently and develop deeper product understanding. Therefore, integrating these perspectives on color psychology, information processing, and user experience, we propose the following research hypothesis:

H5: *In online shopping sites, there is a positive correlation between text color diversity and consumer satisfaction.*

2.3.3. Visual Marketing Element 3: Human Images

In e-commerce, human images, as a crucial visual element in user–brand interaction, are likely to be associated with the consumer shopping experience and satisfaction. Web page design includes multiple visual elements, among which human images play an important role in forming brand image and user experience [12]. The number of human images, images with visible faces, and images of faceless models not only reflect commonly used visual processing methods in web page design but also correspond to three important aspects of visual marketing: information richness, personal connection, and product focus [76,77].

First, we examined the relationship between human images and consumer satisfaction in online shopping from multiple theoretical perspectives. Contemporary research on e-commerce visual elements demonstrates that in online clothing shopping, product images featuring human models significantly enhance consumer product understanding and visualization [78]. Recent empirical studies have expanded this understanding, revealing that human images enrich product visual information and substantially influence consumer evaluation processes [15]. This effect is particularly pronounced in fashion e-commerce, where Boardman and McCormick (2019) found that human model presentations significantly improve consumers' ability to assess fit, style, and overall product attributes [79]. The impact extends beyond mere product visualization to social-psychological dimensions. Research shows that human images enhance social presence in online shopping environments, creating a more engaging and trustworthy shopping experience [23]. These cognitive and social-psychological effects collectively contribute to helping consumers more concretely imagine product usage scenarios and understand product characteristics more deeply. As a result, the alignment between consumer expectations and actual products may increase, potentially enhancing overall satisfaction. Therefore, integrating these perspectives on social presence, mental imagery processing, and consumer psychology, we propose the following research hypothesis:

H6: *In online shopping sites, there is a positive correlation between the number of human images and consumer satisfaction.*

Next, we examine the relationship between human image types (faces visible vs. faceless) and consumer satisfaction through the lens of social comparison theory and self-image congruence theory. The existing literature suggests that displaying clear faces in digital retail environments helps convey brand approachability and credibility. For instance, Shuqair et al. (2024) demonstrated that prominent facial images enhance consumer trust in brands and products [80], while Poirier et al. (2024) noted that visible faces contribute to improved perceived website quality and user experience [81]. Moreover, from the perspective of consumer interaction and emotional connection, visible facial images with expressions and personal characteristics are more likely to evoke emotional resonance among consumers, thereby enhancing user engagement and the shopping experience.

Hassanein and Head (2007) proposed that humanized visual presentations in digital environments effectively increase social presence and facilitate consumer interaction [23]; similarly, Denghua and Lidan (2020) supported this view, suggesting that facial displays enable consumers to better self-identify with products during browsing, enhancing personalized relevance and purchase intention [82]. Conversely, faceless images, lacking explicit facial expressions and emotional conveyance, often struggle to build authentic interpersonal trust and emotional connections. Synthesizing these theoretical perspectives, appropriately increasing the display of visible facial images on online shopping platforms can not only enhance visual experience but also strengthen brand trust, emotional connection, and consumer identification, thereby improving overall consumer satisfaction. Therefore, integrating these perspectives on social comparison, self-projection, and trust formation, we propose the following research hypothesis:

H7: *In online shopping sites, there is a positive correlation between the increase in the proportion of human images with visible faces (decrease in the proportion of faceless human images) and consumer satisfaction.*

2.3.4. Visual Marketing Element 4: Video

In e-commerce, videos, as a major visual element in user–brand interaction, may be associated with the consumer shopping experience and satisfaction. Videos include several important dimensions such as video length, background music, and explanatory text [53,83]. Among these, videos, as dynamic visual elements, are related to product information transmission, user experience, and brand image formation [84]. Video length, background music, and explanatory text not only reflect commonly used video processing methods on e-commerce platforms but are also respectively related to three important aspects of visual marketing: information completeness, emotional experience, and information clarity [53,83].

First, we examined the relationship between product video length and consumer satisfaction from multiple theoretical perspectives. Digital marketing research demonstrate that dynamic product presentations significantly enhance consumer understanding and reduce purchase uncertainty compared to static images [24,53]. Contemporary research has established that longer videos consistently provide more comprehensive product information and detailed demonstrations. This positive effect of video length is evident in Choi and Taylor’s (2014) research, which showed that extended videos enable a more thorough explanation of product functions and usage methods [85]. Supporting this perspective, Zhai et al. (2022) found that longer videos allow for more complete product presentations, leading to enhanced consumer comprehension [86]. Li and Lo (2015) further confirmed that increased video duration provides more opportunities for detailed product information delivery [87]. These factors collectively suggest that longer videos can provide consumers with more comprehensive product information and deeper understanding. As consumers receive more detailed product information through longer videos, their understanding of the product improves, potentially enhancing overall satisfaction. Therefore, integrating these perspectives on information richness and consumer comprehension, we propose the following research hypothesis:

H8: *In online shopping sites, there is a positive correlation between video length and consumer satisfaction.*

Secondly, we examined the relationship between background music in videos and consumer satisfaction from multiple theoretical perspectives. Research in digital marketing demonstrates that strategically selected background music significantly enhances user emotional experience and increases product attractiveness [86]. The psychological

impact of music in digital retail environments is multifaceted. Studies show that background music substantially influences consumer mood, purchase intentions, and brand attitudes [88]. Recent studies have deepened our understanding. Oakes (2007) demonstrated that appropriate background music significantly enhances consumer immersion and engagement with product presentations [89]. Supporting this finding that musical elements in promotional content can strengthen brand attachment and memory [90]. Furthermore, Hwang and Scheinbaum (2020) found that music-enhanced videos create stronger emotional bonds between consumers and brands [91]. These psychological and emotional effects collectively suggest that strategic use of background music can enhance consumers' video viewing experience and strengthen emotional connections to products and brands. Therefore, integrating these perspectives on environmental psychology, emotional contagion, and consumer behavior, we propose the following research hypothesis:

H9: *In online shopping sites, there is a positive correlation between the use of background music in videos and consumer satisfaction.*

Finally, we examined the relationship between video explanatory text and consumer satisfaction from multiple theoretical perspectives. Recent advances in digital marketing research demonstrate that the clarity and precision of textual explanations significantly influence consumers' comprehension of product characteristics and usage methods [53]. The cognitive impact of supplementary text in video content is multifaceted. Studies show that well-designed textual elements effectively complement visual information and enhance consumer product knowledge [84]. Contemporary research has expanded our understanding, showing that the strategic implementation of explanatory text can substantially reduce perceived product uncertainty [92]. Supporting this finding, Roy (2024) demonstrated that synchronized text overlays in product videos significantly enhance consumer comprehension and decision confidence [93]. Furthermore, Du et al. (2024) found that well-structured textual explanations in videos improve information accessibility and reduce cognitive load [94]. These cognitive and information processing effects collectively suggest that video explanatory text plays a crucial role in facilitating consumers' understanding of product information. The effective textual annotations in product videos significantly impact purchase confidence and satisfaction through enhanced product understanding. Therefore, integrating these perspectives on multimedia learning, information processing, and consumer comprehension, we propose the following research hypothesis:

H10: *In online shopping sites, there is a positive correlation between the use of explanatory text in videos and consumer satisfaction.*

Figure 1 shows the analysis model constructed based on the hypotheses of this study. This model analyzes the relationship between four visual marketing elements and consumer satisfaction. Each visual marketing element is divided into several parts, with a total of 10 aspects being analyzed. Building upon theories of visual marketing, cognitive load, and information processing, this study proposes general hypotheses (H1–H10) to investigate the relationships between various visual marketing elements and consumer satisfaction in e-commerce platforms. It should be noted that although data were collected across multiple product categories, including furniture, food, home appliances, accessories, and clothing, we maintained the universality of hypotheses in our initial hypothesis without segmenting them by product categories. This approach was adopted to ensure the parsimony and generalizability of the theoretical framework, avoiding an excessive number of product category-specific hypotheses.

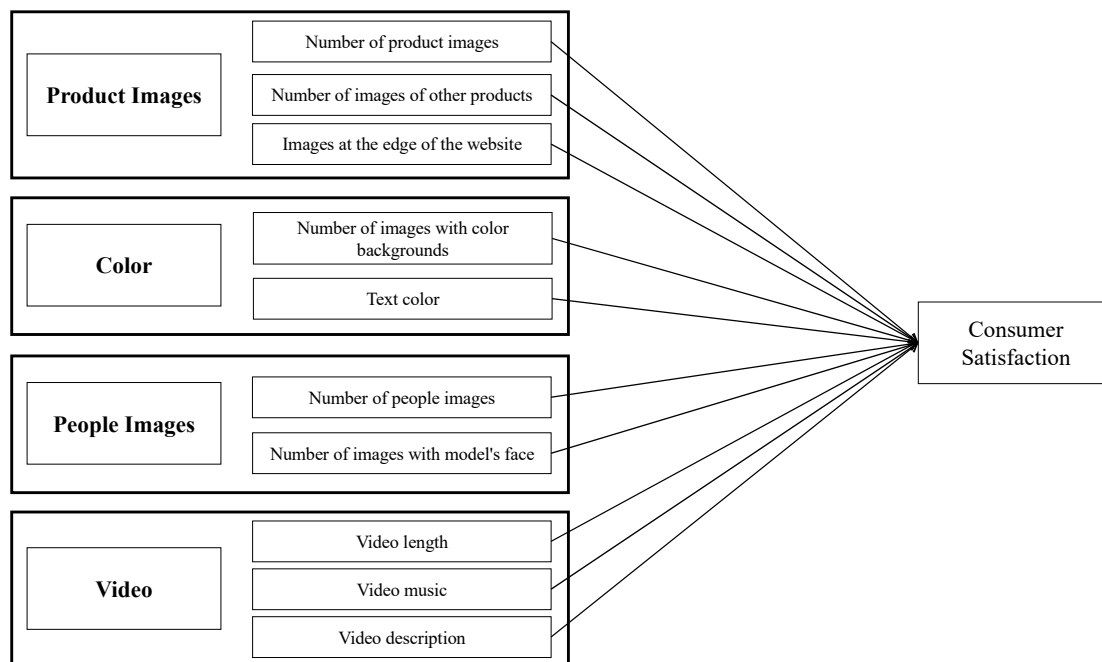


Figure 1. Hypothetical model.

3. Research Methodology

This study used the Rakuten e-commerce platform as the research subject, collecting and analyzing a total of 1500 samples. The study classified visual marketing elements in more detail and analyzed their impact on consumer satisfaction as explanatory variables.

3.1. Data Collection

This research uses Rakuten Ichiba (<https://www.rakuten.co.jp/>, accessed on 3 September 2023), one of the most popular e-commerce sites in Japan, as the research subject for data collection and analysis. The research aim is to elucidate the relationship between e-commerce page design and consumer satisfaction, as well as specific design elements related to this.

Rakuten Ichiba was chosen as the research subject for several reasons. Firstly, as one of Japan's largest e-commerce platforms, it has an enormous user base and a wide variety of products, making its data representative of the purchasing behavior and preferences of the majority of Japanese consumers. Secondly, Rakuten Ichiba demonstrates diversity and innovation in visual marketing, with stores having a high degree of freedom in web page design. This provides rich case studies and data for researching the impact of different visual marketing elements on consumer behavior. Therefore, using Rakuten Ichiba as the research subject allows for a more comprehensive and in-depth analysis of how visual marketing elements actually work in e-commerce.

This study extracted five product categories from Rakuten Ichiba: food, furniture, home appliances, accessories, and apparel. In this study, data processing was primarily conducted through manual data collection by the researchers. After identifying the visual marketing elements, we collected data from the Rakuten shopping website. These samples were randomly selected based on the website's recommendations. For variable measurement, we employed three approaches. First, for quantitative elements (such as the number of product images, number of human images, and video duration), we directly counted or measured these elements on each product page. Second, for categorical elements (such as images on website margins, video music, and video explanations), we used dummy variables based on the presence or absence of these features. Finally, for ratio measurements

(such as the proportion of multi-colored backgrounds and the proportion of visible faces), we calculated ratios by dividing the number of elements with specific attributes by the total number of relevant elements. Since all data in this study consist of objective and directly quantifiable measures (such as the number of images and video duration), reliability is ensured despite data collection being conducted by a single researcher. An inter-rater reliability assessment was not necessary as no subjective judgments were involved in the data collection process. To ensure data reliability, we only selected products with more than 100 ratings. Subsequently, we verified the collected data to ensure their authenticity. The measurements in this study were conducted according to specific and clear criteria. Therefore, variation in the measured values should not occur depending on the person, ensuring the reliability of our measurements. In this study, the reliability of the data is ensured through the accuracy and consistency of the data extraction process, similar to previous studies that used objective indicators directly extracted from e-commerce platforms for calculation without conducting reliability assessments (e.g., [95]). To maintain balance among products within each category, we sampled 300 product pages from each category for a total of 1500 samples.

We conducted descriptive statistical analyses across product categories. Table 1 presents the maximum, minimum, mean values, and standard deviations for three dimensions: price, number of comments, and consumer ratings across different categories. The descriptive statistics reveal substantial price variations among different product categories, with furniture and home appliances showing significantly higher average prices than clothing. Additionally, sales volumes and ratings demonstrate notable fluctuations across categories, reflecting the diversity in consumption frequency, market positioning, and user experience among different products. They also represent the main product groups commonly handled on e-commerce platforms. This selection enables a broad analysis of the relationship between visual marketing elements and consumer satisfaction across different consumer goods categories. To avoid the influence of seasonal factors across different seasons, the data collection period for this study was two weeks, from 14 September 2023, to 28 September 2023. In Appendix A, we present the results of analysis of variance (ANOVA) demonstrating the significant differences across product categories for all variables.

Table 1. Descriptive statistics of product types.

	Food	Furniture	Home Appliances	Accessories	Apparel
Average Price	4538.94	10,032.887	11,483.847	4514.62	3566.3
Maximum Price	32,400	128,000	96,800	49,500	24,200
Minimum Price	216	110	302	399	539
Price Standard Deviation	5089.418	11,982.851	13,436.681	6264.610	3373.040
Average Number of Comments	3098.07	1355.89	1070.673	1839.563	1591.29
Maximum Number of Comments	70,921	45,506	29,719	102,499	54,376
Minimum Number of Comments	216	110	302	399	539
Number of Comments Standard Deviation	8632.108	4144.402	2499.896	6799.834	4324.636
Average Rating	4.508	4.370	4.37	4.394	4.299
Maximum Rating	4.91	4.87	4.97	4.83	4.86
Minimum Rating	3.98	3.42	3.4	3.5	3.14
Rating Standard Deviation	0.215	0.253	0.218	0.239	0.271

3.2. Dependent Variable

This study examined the impact of visual marketing design elements on consumer satisfaction on product pages of e-commerce sites. Product ratings reflect users' product experiences, provide comprehensive consumer evaluations, and offer reference in-

formation to other potential consumers [96]. Ratings are an important indicator for analyzing how consumers perceive product value [97] and show how visual marketing content relates to post-purchase consumer satisfaction. Therefore, this study uses product ratings as a proxy for consumer satisfaction. This variable is based on the ratings (ranging from 1 to 5 points) of products listed on Rakuten Ichiba's e-commerce site from 14 September 2023, to 28 September 2023, and is referred to as " y_i^{Point} ".

3.3. Explanatory Variables

This study conducted analysis using four elements: background, product images, human images, and videos. The following provides detailed explanations.

3.3.1. Visual Marketing Element 1: Images

- Number of product images: This is the number of product photos displayed. This variable is collected by counting the number of photos related to the product on the product page. This variable is referred to as " X_i^{PicNum} ".
- Number of other product images: This variable is the number of photos displayed for other products in the same category. This variable is collected by counting the number of photos related to other products. This variable is referred to as " $X_i^{PicOther}$ ".
- Images at the edge of the website: This variable concerns whether product images are placed at the edges of the web page. It is used as a dummy variable, with "0" when no images are placed at the edges of the website and "1" when images are placed at the edges. This variable is referred to as " X_i^{PicWeb} ".

3.3.2. Visual Marketing Element 2: Color

- Proportion of images with multicolored backgrounds: This variable is the proportion of images with multicolored backgrounds. This variable is collected by calculating the proportion of multicolored images out of all product images. This variable is referred to as " $X_i^{ColMulti}$ ".
- Text color: This variable is the number of font colors used on the website. This variable is collected by counting the types of font colors on the website. This variable is referred to as " $X_i^{ColWord}$ ".

3.3.3. Visual Marketing Element 3: Human Images

- Number of human images: This variable is the number of human images (fashion models or food tasting models) displayed on the website. This variable is collected by counting the number of human images on the website. This variable is referred to as " X_i^{HINum} ".
- Proportion of images with visible human faces: This variable is the proportion of photos where human faces are clearly visible on the website. This variable is collected by calculating the proportion of photos where human faces are clearly visible out of all human images. This variable is referred to as " $X_i^{HIFaceNum}$ ".

3.3.4. Visual Marketing Element 4: Videos

- Video length: This variable is the duration in seconds of videos displayed on the website. This variable is collected by counting the seconds of videos on the website. The logarithm of this value is used in calculations. This variable is referred to as " $X_i^{VideoLenth}$ ".
- Video music: This variable concerns whether music is added to product videos on the website. It is used as a dummy variable, with "0" when no music is added to the video and "1" when music is added. This variable is referred to as " $X_i^{VideoMusic}$ ".

- Video explanation: This variable concerns whether explanatory text is added to product videos on the website. It is used as a dummy variable, with “0” when no explanation is added to the video and “1” when an explanation is added. This variable is referred to as “ $X_i^{VideoDescript}$ ”.

3.4. Control Variables

This study added control variables such as “price of each product”, “number of comments”, “number of store reviews”, and “store score” to the research model. Previous research has demonstrated that product price, sales volume, and store image influence consumer satisfaction [98,99]. Therefore, this study incorporates the following factors as control variables to account for potential influences on the results.

- Number of comments: This should be collected as it may be related to the inherent value of the product. This variable is collected as the number of comments for the product and calculated using logarithms. This variable is referred to as “ $C_i^{SellNum}$ ”.
- Price of each product: Considering that the value of a product may affect consumers’ first impressions, this should be collected as the product price. This variable is collected as the non-discounted price of the product and calculated using logarithms. This variable is referred to as “ C_i^{Price} ”.
- Number of store reviews: The number of store reviews is an important factor affecting consumer trust and purchase intention, and needs to be controlled to accurately evaluate the effect of visual marketing elements. This variable is collected as the number of reviews for the store selling the product and calculated using logarithms. This variable is referred to as “ $C_i^{ReviewNum}$ ”.
- Store score: The overall evaluation of a store may affect the perceived quality of individual products and potentially influence the effect of visual marketing elements. This variable is collected as the score of the store selling the product and calculated using Z-scores. This variable is referred to as “ $C_i^{ShopPoint}$ ”.

3.5. Analysis Model

To comprehensively analyze the relationship between visual marketing elements and consumer satisfaction, multiple regression analysis was adopted. This study draws upon the methodological approach of Luo et al. (2012), who employed linear modeling to analyze large-scale data in examining the effects of online store characteristics and website design on customer satisfaction [95]. In our study, we collect actual transaction data from e-commerce platforms, including information about the use of visual elements such as images and videos, and adopt a similar analytical approach to investigate the impact of visual marketing elements on consumer satisfaction. First, 10 explanatory variables were used to evaluate visual marketing elements. Next, in terms of analytical approach, this study first conducted an overall analysis across all product categories. Subsequently, to explore the differences in the effects of visual marketing elements across different product categories, the model was subdivided into five product category-specific models. These product types include furniture products, food products, home appliance products, accessory products, and apparel products. The following shows the research model for this study:

$$y_i^{Point} = \beta_1 X_i^{PicNum} + \beta_2 X_i^{PicOther} + \beta_3 X_i^{PicWeb} + \beta_4 X_i^{ColMulti} + \beta_5 X_i^{ColWord} + \beta_6 X_i^{HINum} + \beta_7 X_i^{HIFaceNum} + \beta_8 X_i^{VideoLenth} + \beta_9 X_i^{VideoMusic} + \beta_{10} X_i^{VideoExplain} + \beta_{11} C_i^{SellNum} + \beta_{12} C_i^{Price} + \beta_{13} C_i^{ReviewNum} + \beta_{14} C_i^{ShopPoint} + \varepsilon + C.$$

Here, β represents coefficients, ε represents the error term, and C represents the constant term.

This study employed the R programming language for multiple regression analysis. R was selected due to its professional capabilities and widespread application in statistical analysis and data processing. The availability of numerous efficient analytical packages (such as ‘lm’) ensures both processing efficiency and result reliability in data analysis. Multiple regression analysis using the least squares method was used for calculations across all product types. Regarding the issue of multicollinearity, the correlation coefficients between explanatory variables were checked (see Table 2), with the highest correlation coefficient being 0.235 (between ColMulti and Score), and all other correlation coefficients between variables being less than 0.2 in absolute value. Table 3 provides a comprehensive overview of the statistical characteristics in this study. The descriptive statistics results show that while product ratings are relatively concentrated, there are relatively large differences in the distribution of the number of product images, the number of other product images, and video length among image elements. Furthermore, it was confirmed that all variance inflation factors (VIF) for the variables were less than 7 (mean VIF = 1.40, maximum VIF = 1.69). These results suggest that there is no serious multicollinearity problem among the explanatory variables used in this study.

Table 2. Correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11
1. y_i^{Point}											
2. X_i^{PicNum}	−0.038										
3. $X_i^{PicOther}$	0.018	−0.012									
4. X_i^{PicWeb}	0.041	−0.030	−0.007								
5. $X_i^{ColMulti}$	−0.235	0.111	0.021	0.029							
6. $X_i^{ColWord}$	0.030	−0.065	−0.031	0.111	−0.079						
7. X_i^{HINum}	−0.121	0.049	0.070	−0.039	0.163	−0.048					
8. $X_i^{HIFaceNum}$	−0.052	−0.016	0.044	−0.015	0.107	0.033	0.060				
9. $X_i^{VideoLenth}$	−0.076	0.030	0.025	0.080	−0.017	0.057	0.053	−0.005			
10. $X_i^{VideoMusic}$	0.049	−0.054	−0.104	−0.030	−0.135	0.016	−0.063	0.008	0.085		
11. $X_i^{VideoExplain}$	−0.026	0.027	−0.048	−0.023	0.098	0.062	−0.070	−0.075	−0.160	−0.111	

Table 3. Descriptive statistics of visual marketing elements.

	Mean	Standard Deviation	Maximum	Minimum
1. y_i^{Point}	4.388	0.248	4.970	3.140
2. X_i^{PicNum}	30.421	10.247	66.000	2.000
3. $X_i^{PicOther}$	28.887	26.624	166.000	3.000
4. X_i^{PicWeb}	0.649	0.477	1.000	0.000
5. $X_i^{ColMulti}$	0.491	0.138	0.891	0.112
6. $X_i^{ColWord}$	5.173	1.630	9.000	2.000
7. X_i^{HINum}	4.165	1.658	9.000	1.000
8. $X_i^{HIFaceNum}$	0.505	0.137	0.867	0.162
9. $X_i^{VideoLenth}$	23.541	9.382	65.000	10.000
10. $X_i^{VideoMusic}$	0.613	0.487	1.000	0.000
11. $X_i^{VideoExplain}$	0.624	0.484	1.000	0.000

4. Results

Table 4 presents the results of the data analysis. This study examined the impact of different visual marketing elements on consumer satisfaction across five product categories (furniture, food, home appliances, accessories, and apparel). To avoid excessive length, only the significant findings are discussed.

Table 4. Data analysis results.

	Furniture Products	Food Products	Home Appliance Products	Accessory Products	Apparel Products	All Products
	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
PicNum	0.013 [†] (0.007)	0.000 (0.007)	−0.003 (0.007)	−0.006 (0.006)	0.010 (0.009)	−0.004 [†] (0.001)
PicOther	−0.003 (0.016)	−0.020 (0.019)	−0.005 (0.015)	0.013 (0.017)	0.012 (0.016)	−0.000 (0.000)
PicWeb	0.054 [†] (0.029)	−0.040 (0.025)	0.019 (0.024)	−0.056 [*] (0.026)	−0.001 (0.026)	0.005 (0.011)
ColMulti	−0.034 (0.098)	−0.168 (0.103)	0.096 (0.067)	0.164 [†] (0.097)	0.003 (0.078)	−0.001 (0.000)
ColWord	0.001 (0.007)	0.023 [*] (0.010)	0.021 ^{***} (0.006)	0.007 (0.007)	−0.017 [*] (0.007)	0.005 (0.003)
HINum	−0.001 (0.001)	0.002 (0.001)	−0.002 [*] (0.001)	−0.011 ^{***} (0.001)	−0.005 ^{**} (0.002)	0.006 [†] (0.003)
HIFaceNum	0.176 [*] (0.086)	0.081 (0.088)	−0.064 (0.080)	0.038 (0.106)	0.007 (0.079)	0.000 (0.000)
VideoLenth	0.014 (0.036)	0.055 (0.061)	−0.046 (0.037)	−0.054 (0.037)	−0.078 [†] (0.046)	−0.015 (0.015)
VideoMusic	−0.008 (0.027)	−0.029 (0.027)	−0.056 [*] (0.023)	−0.084 ^{***} (0.024)	0.056 [†] (0.029)	−0.002 (0.011)
VideoExplain	0.054 [*] (0.026)	−0.060 [†] (0.035)	0.062 ^{***} (0.024)	−0.029 (0.022)	0.026 (0.029)	0.021 [†] (0.012)
SellNum	0.036 ^{***} (0.011)	−0.007 (0.008)	−0.002 (0.009)	0.009 (0.009)	0.015 (0.009)	0.013 ^{**} (0.004)
Price	0.002 (0.014)	0.055 ^{***} (0.015)	0.047 ^{***} (0.011)	0.046 ^{***} (0.01)	0.076 ^{***} (0.018)	0.045 ^{***} (0.006)
ReviewNum	0.834 ^{***} (0.082)	0.593 ^{***} (0.079)	0.800 ^{***} (0.076)	0.885 ^{***} (0.114)	0.814 ^{***} (0.080)	0.755 ^{***} (0.035)
ShopPoint	−0.034 ^{***} (0.009)	0.008 (0.011)	0.003 (0.009)	−0.051 ^{***} (0.009)	−0.019 [†] (0.011)	0.022 ^{***} (0.004)
Intercept	0.478 (0.473)	1.160 [*] (0.491)	0.369 (0.376)	0.835 [*] (0.587)	0.366 (0.436)	0.784 ^{***} (0.193)
Adjusted R squared	0.354	0.202	0.387	0.436	0.437	0.321

Note: Brackets indicate standard errors. [†] $p < 0.10$. ^{*} $p < 0.05$. ^{**} $p < 0.01$. ^{***} $p < 0.001$.

For furniture products, “proportion of images with visible human faces” ($p < 0.05$) and “video explanation” ($p < 0.05$) showed positive correlations with consumer satisfaction, supporting hypotheses H7 and H10. In the food product category, “text color” ($p < 0.05$) demonstrated a positive correlation with consumer satisfaction, supporting hypothesis H5. For home appliance products, “text color” ($p < 0.001$) and “video explanation” ($p < 0.05$) showed positive correlations, supporting hypotheses H5 and H10. In the accessory products category, “images at the edge of the website” ($p < 0.05$) exhibited a negative correlation with consumer satisfaction, supporting hypothesis H3. For apparel products, none of the explanatory variables supported the hypotheses. Based on these results, hypotheses H1, H2, H4, H8, and H9 were not supported across these five product categories. Results of the entire dataset revealed no significant correlation between visual marketing elements and consumer satisfaction.

Significant findings that did not support the hypotheses are also explained. For home appliance products, “number of human images” ($p < 0.05$) and “video music” ($p < 0.05$) showed negative correlations, contradicting H6 and H9. In the accessory products category, “number of human images” ($p < 0.001$) and “video music” ($p < 0.001$) demonstrated negative correlations with consumer satisfaction, contradicting H6 and H9. For apparel

products, “text color” ($p < 0.05$) and “number of human images” ($p < 0.01$) showed negative correlations with consumer satisfaction, contradicting hypotheses H5 and H6.

5. Discussion

The analysis of this study’s results based on visual marketing elements revealed that relationships differ across product categories. Table 5 summarizes the support status of the study’s hypotheses.

Table 5. Hypothesis support status.

	Furniture Products	Food Products	Home Appliance Products	Accessory Products	Apparel Products	Summary
H1: Number of product images~Consumer satisfaction	-	-	-	-	-	Rejected
H2: Number of other product images~Consumer satisfaction	-	-	-	-	-	Rejected
H3: Images at the edge of the website~Consumer satisfaction	-	-	-	Supported	-	Partially Supported
H4: Proportion of images with multicolored backgrounds~Consumer satisfaction	-	-	-	-	-	Rejected
H5: Text color diversity~Consumer satisfaction	-	Supported	Supported	-	Not supported (reverse)	Conditionally Supported
H6: Number of human images~Consumer satisfaction	-	-	Not supported (reverse)	Not supported (reverse)	Not supported (reverse)	Reversed
H7: Proportion of images with visible human faces~Consumer satisfaction	Supported	-	-	-	-	Partially Supported
H8: Video length~Consumer satisfaction	-	-	-	-	-	Rejected
H9: Video music~Consumer satisfaction	-	-	Not supported (reverse)	-	-	Reversed
H10: Video explanation~Consumer satisfaction	Supported	-	Supported	-	-	Partially Supported

Note: “-” indicates lack of support.

5.1. Interpretation of Results

This study analyzed the relationship between visual marketing elements and consumer satisfaction. The following discusses the verification results and considerations for each element.

First, this study proposed hypotheses regarding image elements, examining the relationship between consumer satisfaction and the quantity of product images, similar images, and peripheral website images. The results showed no significant positive correlation between product image quantity (H1) and consumer satisfaction, possibly because consumers focus more on image quality and information delivery effectiveness rather than mere quantity, which may lead to information redundancy and cognitive saturation. Similarly, variations in the quantity of similar product images (H2) showed no significant relationship with satisfaction, possibly because consumers maintain stable product perceptions and are insensitive to changes in similar images. In the accessories category, peripheral website images showed a negative correlation with consumer satisfaction, supporting H3. Peck and Childers (2003) note that texture and functional details are crucial for accessory products [100]. Our findings suggest that excessive peripheral images may distract attention from these essential features. Jiang and Benbasat’s (2007) research indicates that excessive visual information may impede consumers’ product understanding, aligning with our findings [53]. For accessories, we infer that excessive peripheral information cre-

ates visual interference, hindering the recognition of key product features and consequently reducing satisfaction.

Second, this study proposed hypotheses regarding color elements, examining the relationship between consumer satisfaction and the contrast between single and multiple background colors, as well as text color diversity. Results indicated that single background colors (H4) did not significantly increase consumer satisfaction, possibly because color effects in overall web page design are controlled by multiple factors, with single-tone advantages potentially masked by brand style and other design elements. In the food and appliance categories, text color diversity showed a positive correlation with consumer satisfaction, supporting H5. This may be because moderate text color variations help consumers distinguish key information such as pricing, promotions, or product advantages, effectively guiding attention. Labrecque and Milne (2012) suggest that color diversity helps create hierarchy and visual rhythm, effectively reducing reading fatigue [13]. Additionally, Madden, Hewett, and Roth's (2000) empirical research demonstrates that appropriate color contrast can stimulate consumer interest and memory of product information [101]. This positive correlation highlights how implementing multiple color tones to differentiate information, when aligned with product attributes, can enhance information transmission effectiveness and consequently increase satisfaction.

Next, this study proposed hypotheses regarding human image elements, examining the relationship between consumer satisfaction and both the quantity of human images and the proportion of images with visible faces. In appliance, accessory, and clothing products, results showed a negative correlation between excessive human imagery and consumer satisfaction (H6). This may be because consumers in these categories prioritize product characteristics, and numerous idealized human images can trigger self-comparison and expectation gaps while distracting from the core product advantages, thus reducing overall satisfaction [102]. In the furniture category, increasing the number images with clear facial features (H7) significantly improved consumer satisfaction. This is because furniture products typically relate closely to family, emotions, and living scenarios, and clear, approachable human images better convey warmth and reliability, evoking consumer emotional resonance. Hassanein and Head (2007) note that human images authentically reflecting usage scenarios more easily inspire trust, and when human images are clear [23], consumers benefit in terms of self-identification and emotional belonging, enhancing overall product appeal.

Finally, this study proposed hypotheses regarding video elements, examining the relationship between consumer satisfaction and video duration, background music, and explanatory text in videos. Results showed that extended video duration (H8) did not significantly improve consumer satisfaction, possibly because the advantages of increased product detail display were offset by viewing fatigue effects from a longer duration, failing to create a positive relationship. In the appliance and accessory categories, video background music (H9) showed a negative correlation with satisfaction, potentially because inappropriate background music may distract consumers and impede product information comprehension, disrupting normal video information transmission. Lastly, in the furniture and appliance categories, video explanations showed a positive correlation with consumer satisfaction, supporting H10. This may be because explanatory text can supplement visual information and reduce cognitive load, helping consumers better understand product features [53]. In the furniture and appliance product categories, product explanations can more appropriately guide consumers on usage methods and promote comprehensive understanding of the product. This may lead to an alignment between consumers' product understanding and actual usage.

5.2. Theoretical Contributions

This study analyzed the impact of visual marketing elements on consumer satisfaction across multiple product categories, making the following theoretical contributions:

Firstly, this study is novel in its comparative analysis of the impact of visual marketing elements on consumer satisfaction across multiple product categories (furniture, accessories, food, home appliances, and apparel). While previous research mainly focused on analyzing single product categories or general visual elements [16,39,103], this study goes beyond these limitations to reveal that effective visual marketing strategies differ by product category. Specifically, it adds a new dimension of differing effects of visual elements by product category to Wedel and Pieters' (2012) theory of visual attention [32]. It also provides new insights into the importance of product category as a contextual factor to Khachatryan et al.'s (2018) theory on the influence of visual stimuli on consumer behavior [33].

This study simultaneously analyzed multiple visual elements such as image number and placement, color use, human image use, and video elements, revealing their impact on consumer satisfaction for each product category. This contributes to the refinement of Pieters and Wedel's (2004) model of visual element attention capture. Furthermore, this study contributes to the extension of visual complexity theory [22]. While previous research mainly focused on the complexity of advertising content [104,105], this study revealed the impact of the complexity of visual elements across entire product pages on consumer evaluation. This deepens the understanding of the role of visual complexity in online shopping environments.

These contributions provide empirical support for the importance of product category as a contextual factor in visual marketing theory. Specifically, by quantitatively demonstrating differences in the correlations of visual marketing elements across different product categories, this study contributes to expanding the application scope of existing theories.

5.3. Practical Contributions

This study investigated the relationship between various visual marketing elements and consumer satisfaction, providing specific recommendations for e-commerce platform design and visual element optimization based on testing results across different product categories. The findings indicate that adjusting visual design strategies for different product categories is crucial, as visual elements must not only highlight core product information but also consider potential correlations to achieve both enhanced overall visual impact and user experience.

Regarding image strategy, the research reveals that in the accessories category, an increase in peripheral website images shows a negative relationship with consumer satisfaction, suggesting that design should minimize edge distractions and emphasize product details and functionality. In the furniture category, utilizing human images with clear facial features demonstrates a positive correlation with consumer satisfaction, indicating that displaying authentic, approachable human images helps establish emotional connections. Additionally, the receptiveness to human imagery varies across categories, with excessive human images showing negative correlations with overall satisfaction in electronics, accessories, and apparel products, suggesting a need to reduce human imagery and focus on product presentation.

For color application strategy, findings reveal differential relationships of text color usage. In food and appliance products, text color diversity shows a positive correlation with consumer satisfaction by helping create clear information hierarchy and visual rhythm. However, in the apparel category, excessive color variations may negatively correlate with design consistency, potentially diminishing consumer attention to the clothing items

themselves. Therefore, color strategies should be tailored to product attributes to ensure balance between information transmission and visual aesthetics.

Regarding video content optimization, research indicates that different video production strategies are more appropriate for different categories. In furniture and appliance products, explanatory videos with descriptive text show a positive correlation with consumer satisfaction by effectively conveying key product information and reducing cognitive load during viewing. Furthermore, background music in videos for electronics and accessories demonstrates negative correlations with satisfaction, indicating that video music should be used judiciously for these product types to maintain consumer focus on the core product features.

In conclusion, this study provides empirical evidence and specific optimization recommendations for e-commerce platform visual marketing strategies. Platforms can better meet consumer needs and enhance the shopping experience and overall satisfaction by implementing strategies based on their product categories, including reducing irrelevant image displays, selecting appropriate human imagery, developing targeted color schemes, and optimizing video content.

5.4. Limitations and Future Research

This study analyzed the impact of visual marketing elements on consumer satisfaction, but it has several limitations.

Firstly, as this study is based on the Japanese Rakuten platform, it has certain regional characteristics. Japanese consumers' purchasing habits and cultural backgrounds may differ significantly from consumers in other countries. Future research needs to verify the universality of this study's results under different countries and cultural backgrounds.

Secondly, this study only analyzed data from a specific period and could not fully capture the influence of temporal factors such as seasonal variations, promotional activities, and long-term trends on the effects of visual marketing elements. Future research needs to analyze how these temporal factors affect the effects of visual elements using more long-term data.

Thirdly, this study is based on the Lotte platform for its investigation, so the visual marketing characteristics of this research are all derived from the elements provided by the Lotte shopping platform. Therefore, the visual marketing elements may be influenced by the limitations of the Lotte platform itself. Thus, future research should conduct a comprehensive investigation of visual marketing elements across multiple platforms.

Finally, this study could not fully consider the influence of consumer individual characteristics (age, gender, purchasing experience, etc.) on the effects of visual marketing elements. These individual differences may have a significant impact on the perception and evaluation of visual elements. Future research requires more detailed analysis using consumer segment-specific analysis and individual-level data.

6. Conclusions

This study comprehensively analyzed the relationship between visual marketing elements and consumer satisfaction on online shopping platforms. Using Rakuten Ichiba as the research subject, it examined four major visual marketing elements—product image elements, color elements, human image elements, and video elements—across five major product categories: furniture, accessories, food, home appliances, and apparel. The research results revealed that the relationship between visual marketing elements and consumer satisfaction varies greatly depending on the product category. Specifically, in the food and home appliance sectors, text color diversity showed a positive correlation with consumer satisfaction. In the furniture category, a higher number of human images with visible

faces positively influenced consumer satisfaction. Finally, video explanations were found to have a favorable impact on consumer satisfaction in both the furniture and home appliance categories.

Next, these results will be discussed in relation to the relevant theories. For example, the positive relationship with text color diversity may be explained by its ability to enhance visual appeal and readability, thereby reducing consumers' cognitive load and facilitating better satisfaction [74]. In contrast, the positive relationship with human images with visible faces in the furniture category can be linked to social presence theory, wherein clear facial expressions foster trust and emotional connection, ultimately boosting consumer confidence [23]. Similarly, the positive correlation with video explanations likely stems from their capacity to provide rich, detailed information that bridges knowledge gaps and reinforces purchase satisfaction [83].

This study makes important contributions to both visual marketing theory and e-commerce practice. Theoretically, it provides new insights into the relationship between visual elements and consumer satisfaction across different product categories, filling gaps in existing research. Practically, it provides specific guidelines for online retailers to optimize website design and improve consumer satisfaction. This study has several limitations. Firstly, as it only uses data from Japan's Rakuten market, there are restrictions on the generalizability of results. Secondly, as it only analyzes data from a specific period, it cannot fully capture the influence of temporal factors such as seasonal variations and long-term trends. Lastly, the study's limitation also includes not fully considering the influence of consumer individual characteristics on the effects of visual marketing elements.

Therefore, this study reveals the importance and complexity of visual marketing in e-commerce. Understanding the relationship between visual marketing elements and consumer satisfaction is crucial for business success. This can contribute to improving user satisfaction and value creation on e-commerce platforms.

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Appendix A. Analysis of Variance Results for Product Category Differences

This appendix presents detailed ANOVA results examining differences across product categories (furniture, food, home appliances, accessories, and apparel) for consumer satisfaction and visual marketing elements. Table A1 presents the results of the analysis of variance (ANOVA).

To verify statistical differences in consumer satisfaction and visual marketing elements across the selected product categories (furniture, food, home appliances, accessories, and apparel), we conducted one-way analysis of variance (ANOVA). Results revealed a significant effect of product category on consumer satisfaction ($F(4, 1495) = 30.27, p < 0.001$).

Tukey HSD post hoc comparisons were employed to further clarify differences between categories. Results indicated significantly higher consumer satisfaction in furniture (mean difference = 0.071, $p < 0.005$), home appliances (mean difference = 0.071, $p < 0.005$), accessories (mean difference = 0.095, $p < 0.001$), and food (mean difference = 0.209, $p < 0.001$) compared to the apparel category. This finding suggests that among the product categories examined in this study, consumer satisfaction in the apparel category was significantly lower than other categories, with the most notable difference observed between apparel and food categories.

Beyond consumer satisfaction, we conducted one-way ANOVA to examine differences in visual marketing elements across product categories to investigate variations in visual presentation strategies. For image elements, variables including the number of product images ($F(4, 1495) = 32.8, p < 0.001$), the number of images of similar other products ($F(4, 1495) = 23.02, p < 0.001$), and images on the periphery of web pages ($F(4, 1495) = 6.704, p < 0.001$) all demonstrated significant between-group differences. Regarding color elements, analysis demonstrated significant category effects for both color multiplicity ($F(4, 1495) = 61.51, p < 0.001$) and text color diversity ($F(4, 1495) = 23.1, p < 0.001$). For indicators involving human imagery, tests of the number of human images ($F(4, 1495) = 33.35, p < 0.001$) and human images with visible faces ($F(4, 1495) = 8.345, p < 0.001$) indicated substantial differences across product categories in the selection of human figures or models in advertisements. Finally, all variables in video elements exhibited significant differences across product categories. Notably, video length showed particularly pronounced between-group effects ($F(4, 1495) = 202.5, p < 0.001$), while differences in background music ($F(4, 1495) = 33.46, p < 0.001$) and explanatory text in videos ($F(4, 1495) = 35.03, p < 0.001$) also reached significance. These findings validate the differences in visual marketing elements across product categories, demonstrating the necessity of category-specific analysis.

Table A1. Summary of ANOVA results.

	Sum of Squares	Mean Square	F-Statistic (4, 1495)	p-Value
Consumer Satisfaction	6.90	1.726	30.27	<0.001
PicNum	12,706	3177	32.8	<0.001
PicOther	61,697	15,424	23.02	<0.001
PicWeb	6.0	1.506	6.704	<0.001
ColMulti	46,074	11,519	61.51	<0.001
ColWord	232	57.98	23.1	<0.001
HINum	338	84.40	33.35	<0.001
HIFaceNum	6111	1527.8	8.345	<0.001
VideoLenth	46,402	11,601	202.5	<0.001
VideoMusic	29.2	7.312	33.46	<0.001
VideoExplain	30.2	7.539	35.03	<0.001

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