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Big Data Analysis on Emotional Drivers and Strategies for Slow Fashion Consumption

Yu Suxia[1*], Rosita Mohd Tajuddin[1], Shaliza Mohd Shariff[1], Meng Tao[2]

[1] College of Creative Arts, Universiti Teknologi Mara (UiTM), Shah Alam, Malaysia,
[2] College of Art and Design, Shijiazhuang Information Engineering Vocational College, Shijiazhuang, China

2022968941@student.uitm.edu.my, rositatajuddin@uitm.edu.my, shaliza478@uitm.edu.my, 591170864@qq.com
Tel: 60177962615

Abstract
This study explored the emotional drivers of slow fashion consumption through big data analysis. Python was used to capture more than 10,000 slow fashion clothing review data from e-commerce platforms, and advanced data analysis (LDA, TF-IDF, semantic network) was used to reveal the emotional drivers of slow fashion consumers systematically. The research results show that consumers' purchase decisions are no longer limited to traditional quality and comfort but multi-dimensional emotional needs. Highlight the connection between the emotional needs of slow fashion consumers and better serve consumers to demonstrate the community's well-being and quality of life.

Keywords: Big data; Slow fashion; Consumer sentiment; Text mining

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1.0 Introduction

With the rapid development of the global economy, the natural environment on which human beings depend for survival is facing unprecedented challenges. Particularly in China, as the public awareness of environmental protection continues to grow, slow fashion is emerging as a responsible and sustainable way of consumption. It has become a new force in promoting the harmonious development of society, the economy, and the environment (Domingos et al., 2022). Slow fashion is a consumption trend that encourages people to think about the impact of their behavior on the planet and choose products that meet their personal needs and serve the environment. In this process, how to effectively steer consumer purchasing preferences towards slow fashion has become an important issue for academia and industry.

This study aims to dig deeper into the emotional drivers of slow fashion consumers using big data techniques. Thus, the objective is to ensure that the new research method can break through the limitations of traditional questionnaire survey methods, achieve large-scale, real-time consumer emotional data analysis, reveal the multi-dimensional complexity of slow fashion consumers' emotional needs, and go beyond a single product functional assessment. It provides a new perspective and path for research in slow fashion and helps enterprises better understand and meet the diversified needs of consumers.

Previous research suggests that emotions are crucial in consumers' purchasing decisions. According to Castro-López et al. (2021), consumers are more likely to support and recommend the brand when they feel satisfied and belong. Therefore, an in-depth study of consumers' emotional needs in slow fashion is crucial for developing effective marketing strategies.

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2.0 Literature Review

2.1 Slow fashion

Driven by environmental protection and sustainable development, slow fashion, the antithesis of fast fashion, has gradually become a hotspot for academic research and business practice. It advocates saving resources and reducing environmental burdens through high-quality products, long-lasting use, and transparent and open production. However, the acceptance of slow fashion has been uneven in the global market, especially in China, where factors such as high prices, lack of brand recognition, and design differences have limited its development (Karim et al., 2024). Nonetheless, this market shows excellent potential as Chinese consumers become more environmentally conscious.

2.2 Emotion

Emotions play a key role in consumer behavior, especially in purchasing decision-making. According to the existing literature, emotions in the consumption of slow fashion products can be categorized into three main types: positive consumer emotions, negative consumer emotions, and neutral consumer emotions (Wang et al., 2024).

Positive consumer sentiment mainly stems from consumers' positive perceptions and emotional experiences of slow fashion products. Research has shown that positive and optimistic emotional appeals can significantly increase consumers' perceived value and sense of responsibility towards slow fashion products, which in turn promotes purchasing behavior (Wang et al., 2022). Such positive emotions increase consumers' loyalty to the brand and motivate them to be more willing to share their shopping experiences and promote the brand. On the contrary, negative consumer sentiment is caused by negative emotional appeals. Such negative emotions inhibit their willingness to buy and may damage the brand image. Therefore, establishing a transparent and authentic green marketing strategy is essential to win consumers' trust. Neutral consumer sentiment, conversely, manifests itself as a more muted emotional response to green products, with purchasing behavior being random, neither positive nor negative. This sentiment may stem from the lack of emotional response due to consumers' insufficient information and knowledge about green products (Woo & Kim, 2019). The presence of neutral emotions reminds companies to pay more attention to product promotion to enhance consumer awareness and acceptance of green products.

While prior research has extensively explored functional drivers of slow fashion consumption, such as price and quality, it has overlooked the emotional and experiential dimensions critical to modern consumer behavior. Emotions play an important mediating variable in the shopping lifestyle and impulse buying. For example, factors such as shop atmosphere, discounts, hedonic shopping motives, and fashion involvement influence impulse buying through positive emotions, promoting unplanned buying behavior (Gamaya & Suardana, 2024). Overall, emotions directly drive consumer purchasing behavior and act as a bridge between other influences.

2.3 Data-driven approach to emotion research

Big data technologies have revolutionized the way we obtain information about consumer sentiment. Within the last five years, approaches to studying green consumer sentiment have focused on exploring how consumers' emotional factors influence their green purchase intentions through quantitative analysis methods such as questionnaires, structural equation modeling (SEM), and partial least squares (PLS-SEM). For example, according to Yu et al. (2024), data were collected using questionnaires, and the impact of emotional perceptions on green furniture purchase intentions was analyzed using PLS-SEM.

However, these research methods have some drawbacks. First, quantitative studies rely on self-reported data, leading to bias and doubt. Second, questionnaires typically require large sample sizes to ensure statistical significance, which increases research costs and time. In addition, although structural equation models can deal with complex causal relationships, their assumptions are strict, and the normal distribution of data is required, which may limit the models' application scope. In contrast, big data technology breaks through the time limitations of traditional research methods, making emotion capture more real-time. For example, Hasan and Sutikno (2021) show that social media emotion-tracking systems can quickly analyze a large amount of text data to realize micro-dynamic monitoring of emotional attitudes. This ability has led to significant methodological innovations in applying consumer sentiment research. It improves the efficiency and accuracy of sentiment analysis and provides new perspectives and tools for an in-depth understanding of consumer behavior.

3.0 Methodology

3.1 Research design

The research design uses big data analysis technology and multi-step research methods to explore the emotional driving factors of slow fashion consumers. First, Python web crawler technology was used to grab about 10,000 slow-fashion consumer reviews from e-commerce platforms. After data processing, the core visualization is extracted through the bag of words model and TF-IDF calculation, and consumers' emotional needs are focused. Combined with semantic network analysis and visualization tools (such as LDAvis), we can deeply understand the keywords and emotional correlation features in consumer reviews, comprehensively understand the emotional drive of consumer behavior, and lay a theoretical foundation for the formulation of slow fashion industry strategies.

3.2 Web crawler technology

Web crawler technology is the first step in data collection that allows us to automatically obtain and extract information from the Internet.

The Taobao and Tmall platforms of China's Alibaba Group, which are among the largest e-commerce websites in China, have a large amount of consumer review data. These two platforms selected ten slow fashion apparel brand shops as data sources. These shops were selected because they represent popular trends slowly and have an active user base. Using Python, consumer review data can be grabbed, including review text, ratings, user information, etc. In this study, we successfully crawled about 10,000 consumer review contents for data preprocessing.

3.3 Text processing

Text processing is an important step in converting raw text data into a structured format suitable for further analysis. This study converts consumer reviews into numerical representations to facilitate statistical analysis. The big data approach focuses on identifying the most important keywords to help extract meaningful information from text data.

3.3.1 Construct bag-of-words model and TF-IDF calculation

In this research, we employ the Bag of Words (BoW) model and the TF-IDF (Term Frequency-Inverse Document Frequency) method to convert textual data of consumer reviews into numerical representations suitable for machine learning and statistical analysis.

Bag-of-words (BoW) modeling represents text in a numerical form that does not consider the order of words but only counts the frequency of their occurrence in the text. We first constructed a dictionary using the Dictionary class from the Gensim library, which maps each word in the text to a unique integer identifier. Subsequently, the textual data was converted into a bag-of-words model representation by removing words with very low or high frequency of occurrence in the text set.TF-IDF is a measure of the importance of a word in a collection of documents, which combines the word frequency (TF) and the inverse document frequency (IDF). The higher the TF-IDF value, the more important the word is in the document, whilst it occurs less frequently throughout the collection of documents. By calculating the TF-IDF value, we can identify the keywords that contribute the most to the document's topic, which is essential for understanding the document's content and for effective information retrieval.

3.3.2 Justification for Using LDA Topic Modeling

Latent Dirichlet Allocation (LDA) was selected for its proven ability to uncover hidden themes within large text datasets, making it ideal for analyzing complex relationships in consumer reviews. Its probabilistic framework supports the study's goal of slowly exploring multi-dimensional emotional drivers by revealing nuanced patterns and sentiment associations.

Compared to alternatives like Latent Semantic Analysis (LSA) and Non-negative Matrix Factorization (NMF), LDA offers clear probabilistic interpretations of topics and their relationships, enabling more profound insights into consumer behavior. Additionally, perplexity optimization ensures that the extracted topics comprehensively represent emotional needs. Finally, LDA's integration with tools like LDAvis enhances result visualization, facilitating intuitive interpretation and actionable insights for practical applications.

3.4 Semantic network-based feature association analysis

Semantic network analysis further deepens the understanding of consumer behavior. Co-occurrence network diagrams provide an intuitive way to see the connections between keywords, helping us to understand how the themes and concepts discussed in consumer reviews are interrelated, to build a semantic network reflecting consumer preferences, and to predict which new fashion combinations are likely to be well received by the market.

4.0 Findings

4.1. Draw word cloud diagrams

In order to see more intuitively the consumers' concerns and demand for the enterprise's green products, this paper draws word cloud diagrams of the review texts after completing data collection and data cleaning. By obtaining the word cloud is generated, as shown in Fig. 1, the top twenty high-frequency words, as shown in Fig. 2, the word cloud is generated, as shown in Fig. 2. The research found prominent 'wear,' 'comfortable,' 'color,' 'fabric,' 'size' and other characteristic words intuitively express consumers' demand for slow fashion products.

Fig. 1: Word cloud

(Source: developed by the author)

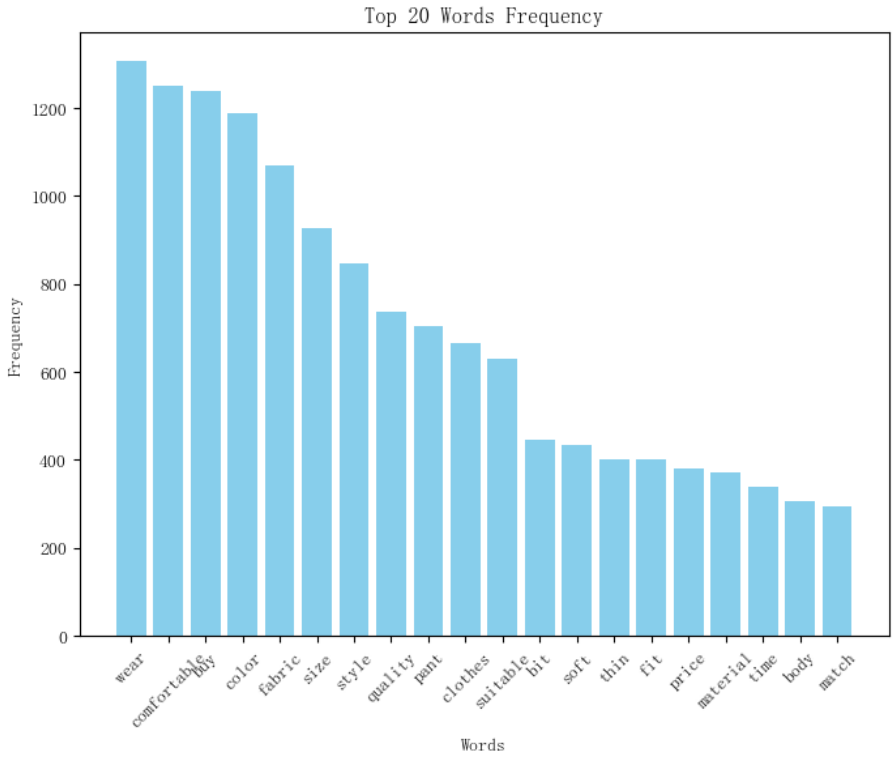

Fig. 2: Top 20 words frequency
(Source: developed by the author)

4.2 Analysis based on the change of perplexity with the number of themes

First of all, observing the trend of perplexity (Fig. 3), it can be found that perplexity gradually decreases as the number of topics increases. This means that the model's fit to the data is improving. However, when the number of themes increases to 7, the decrease in perplexity begins to decrease, showing a clear inflection point. This phenomenon suggests that seven themes are an appropriate number to effectively capture the important information in the data while maintaining the stability of the model.

Secondly, observing the changing trend of the degree of confusion, it can be found that with the increase in the number of topics, the degree of confusion gradually decreases. This means that the model's ability to fit data is constantly improving. However, when the number of topics increased to seven, the reduction in confusion began to decrease, showing a clear inflection point. This means that slow fashion consumption is undergoing a profound transformation. Companies must pay close attention to the changes in consumers' emotional needs and meet the emerging trend of slow fashion through flexible production and sales. The continued downward trend in assets may also reflect slow fashion consumers' focus on the emotional value of products rather than simple materiality.

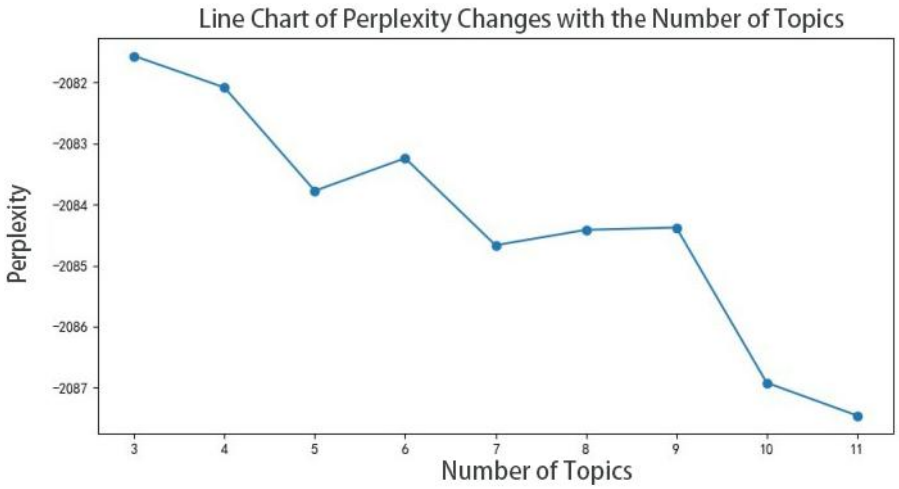

Fig. 3: The line chart of perplexity changes with the number of topics
(Source: developed by the author)

4.3 LDAvis visualisation analysis

Intertopic Distance Map This map shows the distance relationship between different subjects and visually reflects the similarities and differences between subjects. For the research on slow fashion consumption, we can find themes such as "sensibility," "experience," and "value" together from the map, indicating that these themes may be more relevant to the emotional demands of slow fashion consumers. Consumers pay more attention to the sensory experience brought by the product rather than the simple functionality.

This section shows the various inscriptions related to slow fashion consumption and their frequency of occurrence in the text. We can see that some words related to emotion, such as "image," "comfort," "feeling," etc., appear more frequently. This also shows that mining and meeting consumers' emotional needs will have an advantage in the fierce market competition. Brands need to comprehensively consider product quality, design, brand image, service experience, and other factors in marketing to create an overall image that meets consumers' emotional demands.

Therefore, when conducting market positioning and consumer-driven emotion analysis, slow fashion brands should focus on multiple dimensions to create a brand image and shopping experience that meets the needs of modern consumers.

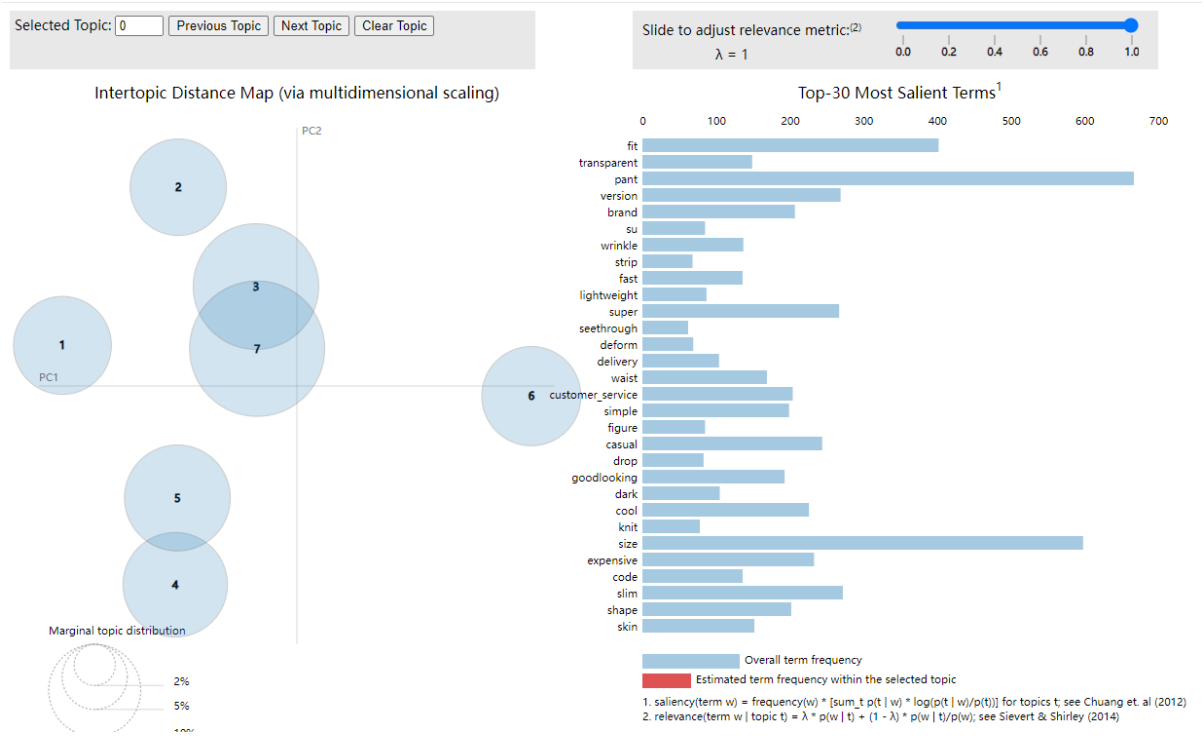

Fig. 4: Visualization results when the number of topics in the overall review is 7.

(Source: developed by the author)

4.4 Semantic network-based feature association analysis

By building a network model based on semantic relationships, researchers can explore the correlations between different topics and how those correlations affect consumers' purchasing decisions. In this graph, nodes (circles) represent different words, and edges (lines) represent the relationships between those words. The lines' thickness may indicate the association's intensity or frequency. There are several central nodes in the figure, such as "quality," "price," "comfortable," etc. These words have more connections with other words, indicating that they are the core concepts in the discussion.

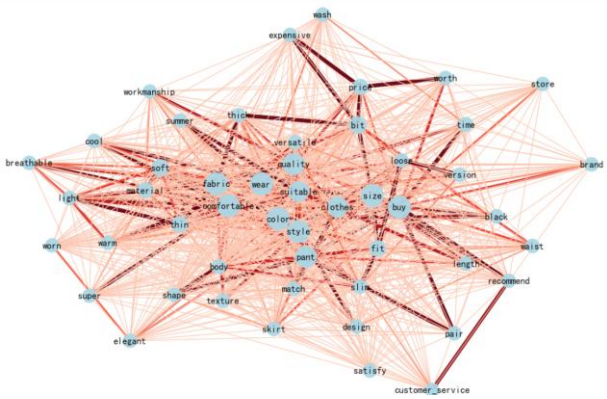

Fig. 5: Semantic map of the web for slow fashion products

(Source: developed by the author)

The emotional attributes of consumers are the most prominent, and many concepts such as "feeling," "experience," and "comfort" are gathered together, indicating that in slow fashion consumption, consumers' emotional needs and experiences are critical. Secondly, there are some concepts related to product attributes, such as "texture," "version," "soft," etc., which indicate that in slow fashion consumption, through the adjustment of product design, it can meet the emotional demands of consumers, and it is also worth discussing the focus. Words like "brand" and "image" also appear in the thematic correlation chart, indicating the brand's position in slow fashion consumption. Consumers may express self-identity and social status through brands, which is an emotional driver that companies must focus on.

5.0 Discussion

This research focuses on the emotional driving factors of slow fashion consumers and uses oversized data analysis methods to identify and refine their core needs systematically. The findings show that consumers are concerned about the quality and price of products, the brand's responsibility, and environmental values, and these emotional factors play a crucial role in purchase decisions.

The key findings of this study are consistent with some theories in the existing literature; for example, the study found that positive emotional appeals significantly enhance consumers' perceived value and promote purchase behavior, which is consistent with the findings of Wang et al. (2022). However, there are some new insights. Firstly, concerning consumers' concern for the environment, previous studies have generally pointed to sustainability as an important driver of slow fashion consumption, emphasizing the relationship between brand trust and loyalty. The present study further confirms the importance of slow fashion in brand development, especially in terms of its role as an effective driver that not only influences consumers' purchasing decisions but also profoundly affects identification and emotional resonance with the brand (Zheng, 2024). In the past Švajdová (2024) study, consumers increasingly value personalized and customized products and services in their slow fashion consumption. Through LDAvis visual tools and semantic network analysis, this study further shows an important emotional connection between personalized service and the shopping experience of slow fashion consumers. It reveals the transformation of consumers from functional consumption to value consumption.

This study fills this gap by comprehensively analyzing the multi-dimensionality of emotional drivers. It provides a new theoretical contribution to the study of slow fashion consumer behavior, highlighting consumers' comprehensive evaluation and emotional dependence on brands rather than just focusing on a single element. The implications of this research extend beyond the slow fashion industry, providing valuable insights into industries such as green technology, ethical consumerism, and sustainable food production. Emotional branding and sustainability initiatives can foster deeper consumer loyalty and advocacy in these industries. For example, companies promoting eco-friendly innovation can adopt strategies emphasizing emotional engagement to increase consumer interest. By highlighting sustainable consumption's emotional and social rewards, businesses and policymakers can craft campaigns that resonate with consumers and encourage a shift to more environmentally responsible lifestyles. This research demonstrates the transformative potential of emotional drivers in shaping consumer preferences, providing viable strategies for academic and practical applications across multiple fields.

6.0 Conclusion & Recommendations

In conclusion, this essay reveals the complex emotional drivers of contemporary consumers in green consumption through an in-depth analysis of online reviews of slow fashion products, providing valuable information for the sustainable development of the apparel industry. Through a series of data research analyses, we can find that consumers have shifted from the pursuit of single-product functionality to more careful value considerations and that they not only pay attention to the essential attributes of apparel but also incorporate the brand's eco-friendly concepts into the important dimensions of their purchasing decisions. Their emotional attitudes influence consumers' ultimate purchasing behavior, and the choice of products with eco-friendly characteristics has gradually become the focus of consumers' attention.

6.1 Limitation of Research

This study's limitation is that the sample size for data collection is limited to 10,000 reviews on online shopping platforms, and the existing regional and cultural differences may have a one-sided impact on the results.

6.2 Suggestions for Future Research

In the future, the sample size should be expanded, cross-regional and cross-cultural comparative studies conducted, and more qualitative research methods combined with offline surveys should be introduced to improve the depth and breadth of the research. In the final analysis, it is necessary to formulate a more comprehensive research method to analyze consumers' complex emotions so as to better meet their needs and promote the development of the slow fashion industry.

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Paper Contribution to Related Field of Study

The paper contributes to the field of commercial/retail/service environments.This study used big data analysis (LDA, TF-IDF, semantic network) on 10,000+ e-commerce reviews to reveal emotional drivers in slow fashion, highlighting multi-dimensional needs beyond quality and comfort.

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