

The Applicability of Synthetic Materials as Vegan Alternative Materials: A Time Series Analysis of Sentiment and Dynamic Networks

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Vegan fashion refers to fashion items made from synthetic or eco-friendly materials, without using any animal material, including leather, fur, silk, or wool (Gottfried, 2017). However, it is also true that the environmental problems that may arise from the use of synthetic materials such as polyester, nylon, and acrylic have also been criticized by some. Some consumers claim that fur from the carcasses of roadkill animals, which were not slaughtered in a cruel manner, is in the cruelty-free category (Styles, 2014). Therefore, major discourses and attitudes on fashion materials can vary based on the material as well as the values that individual consumers focus on. In this study, we conducted a sentiment analysis and a structural analysis of networks to find out the changes in the consumer attitude and discourse shown toward animal materials. First, using sentiment analysis through deep learning, we examined the sentimental changes in global consumers over a period of time toward animal materials and alternative synthetic materials. Second, based on the correlation between network structures, we examined whether significant changes occurred in the consumer discourse in the time-series.

Based on prior research, fur, down, leather, silk, and wool were selected as the representative animal-derived materials (Bae, 2020), and the synthetic materials selected were artificial fur, artificial (wellon), artificial leather, artificial silk (viscose rayon), and polyester (knit). From 2011 to 2020, user tweets containing keywords for these individual materials were collected for each year, and advertising data and retweets were removed. For the accuracy of sentiment classification, tweets with a reliability of less than 0.80 were removed from the original data. Most of the neutral tweets were classified as negative, and it was assumed that the negative responses in this study included both negative and neutral responses. The matrix for each material automatically extracted up to 500 words based on the frequency of appearance. Python 3.7 and NodeXL 1.0.1 were used for data collection and analysis, and BERT (Bidirectional Encoder Representations from Transformers) was used for sentiment analysis.

The results of this study are as follows. First, it was found that positive attitudes decreased and negative attitudes increased in the present as compared to the past for most animal materials except fur. In contrast, most of the synthetic materials, except for viscose rayon, garnered more positive attitudes in the present than in the past. Even for the same type of material (animal-derived or synthetic), there is a difference in the sentimental change in consumers, depending on

the detailed type. Leather, silk, wool, wellon, and viscose rayon were found to be materials toward which consumers' sentiment changed irregularly over time. These materials can be presumed to be unaffected by fashion trends or other external factors. On the other hand, for fur, down, artificial fur, and artificial leather, consumers' sentiment showed consistency, regardless of time. In previous studies, fur was defined as a strict material, restricted in vegan fashion in the order of fur, down, leather, silk, and wool (Bae, 2020). In this study, in the case of fur and down, which are the most stringent materials, consumers' sentimental changes were consistent, regardless of fashion trends or external factors. At a lower level of rigor in vegan fashion (leather, silk, and wool), they were influenced by fashion trends or external factors.

Second, as a result of the correlation analysis of each network measurement index over time, the consumer discourse network about down has the number of edges, density, and average of degree centrality. Consumer discourse on down decreased in the number of major sub-topics over time, and discussions within the topic were also inactive. In most cases, interest in animal materials and interest in alternative materials did not show an organic correlation with each other. However, while consumers' interest in down decreased significantly over time, their interest (density) in wellon—a material that replaced down—increased significantly. As an independent material, wellon can be seen as a material that can sensitively change consumer reactions depending on fashion trends or external factors; at the same time, it can be seen as the alternative vegan material with the highest potential for replacing animal-derived materials. Only polyester, which is an alternative material to artificial wool, had a significant positive correlation with positive sentimental change. Based on this, we confirmed that polyester is getting positive evaluations from consumers as time goes by.

The implications of this study are as follows. We confirmed that in the case of expensive animal materials, there is an enthusiasts continue to exist, regardless of the increase in social awareness about animal protection and the decrease in fur production (Choi et al., 2021). Nevertheless, the evaluation of most animal materials has changed negatively over time, and some materials (down) showed a statistically significant decrease in interest. On the other hand, it was confirmed that the evaluation of most artificial synthetic materials is changing positively over time. Consequently, although artificial synthetic materials are being considered to be damaging to the environment, it can be seen that they are generally positively evaluated as compared to animal materials. By finding the most suitable alternative to animal-derived materials, this study can help vegan fashion brands and ethical designers in their selection.

References

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