

Article

Ethical Consumers' Awareness of Vegan Materials: Focused on Fake Fur and Fake Leather

Yeong-Hyeon Choi ¹  and Kyu-Hye Lee ^{2,*} ¹ Department of Clothing and Textiles, Hanyang University, Seoul 04763, Korea; choiyh@hanyang.ac.kr (figure)² Human-Tech Convergence Program, Department of Clothing and Textiles, Hanyang University, Seoul 04763, Korea

* Correspondence: khlee@hanyang.ac.kr; Tel.: +82-2-2220-1191

Abstract: With an increase in ethical awareness, people have begun to criticize the unethical issues associated with the use of animal materials. This study focused on the transition of global consumers' awareness toward vegan materials and the relationship between the interest in ethical subjects such as animals, the environment, and vegan materials. For this purpose, consumers' posts about fur/fake fur and leather/fake leather uploaded on Google and Twitter from 2008 to 2019 were utilized, and the Term Frequency-Inverse Document Frequency (*Tf-idf*) value was extracted using Python 3.7. Furthermore, the worldwide Google keyword search volume of each word was analyzed using Smart PLS 3.0 to investigate global consumers' awareness. First, with time, consumers began relating animal materials such as fur and leather to topics such as animal rights, animal abuse, and animal protection. Second, as interest in "animal welfare" increased, interest in "fake fur" also rose, and as interest in "cruelty free" increased, interest in "fake fur", "vegan fur", and "vegan leather" also increased. Third, as consumers' interest in the "environment" increased, interest in vegan materials such as "fake fur" and "fake leather" decreased. However, as interest in "eco" increased, interest in "vegan leather" also augmented.

Keywords: vegan materials; fake fur; fake leather; animal welfare; cruelty-free; vegan fur; vegan leather; eco; social big data analysis



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1. Introduction

The issue of cruel slaughters of animals for fashion materials such as fur and leather has always been unethical in modern fashion industries, leading to criticism. Moreover, the priority of industrial productivity over animal welfare has been criticized [1]. The over-40-billion-dollar global fur industry has been under tremendous scrutiny, especially over the past few years, for its inhumane practices [2]. The unethical issues of the fashion industry related to animal rights include the killing of foxes, minks, raccoons, or alligators, the hurting of animals for testing dyes due to the production of materials from fur and leather [3], and the pollution of ecosystems through the release of toxic chemicals during the production process [4]. Criticism has increased since the release of *Animal Liberation* by Peter Singer in 1975 [5], which assumes that animals have rights and humans have moral obligations toward them [6]. Eventually, the ethical consciousness of consumers improved. By the 1970's, fur garments transformed from a status symbol to a target of animal rights activism [7]. The use of fur and leather for fashion products has faced antagonistic oppositions from animal rights advocates [8].

Most fur products—as well as leather—are manufactured via factory breeding; the animals are treated in small, dirty cages and later cruelly slaughtered. In particular, alligators, whose skin is used for handbag manufacturing, are bred in a single tank, locked, and slaughtered at the age of three by being shot or flogged. As such, three to four alligators are killed to make a single handbag [4]. Besides, such animal products involve environmental issues, in that the creation of fur coats via factory breeding requires twice

the amount of energy needed for that of artificial fur coats; strong chemical processes are conducted to prevent the fur and leather from rotting in closets. The fur industry was reported in the top five industries worldwide having toxic metal pollution levels [9].

Thus, criticism of products manufactured from animal fur and leather, with regards to environmental issues and animal welfare, is inevitable. Several civic groups and the animal protection group PETA (People for the Ethical Treatment of Animals) strongly encourage animal-friendly production process such as the substitution of animal fur for vegan materials [10], and at the national level, the entire world centering the EU countries have enforced regulations on fur restrictions. For example, England has banned fur breeding since 2000 and Austria since 2004. The Netherlands, the second-largest mink producing country in the EU, passed the law on banning fur breeding in 2012 and declared that all mink farms be closed by 2024 [11].

In the fashion industry, the culture in the luxury market's interest in environmental consciousness has led to the trend of utilizing fake fur in high-end designs [2]. Furthermore, many luxury brands such as Burberry have banned animal fur in recent years. Even London Fashion Week, one of the four major fashion weeks, banned fur in 2018; Helsinki Fashion Week and Stockholm Fashion Week followed, banning fur and exotic skin [12]. In addition, changes occurred in firms and consumers. For example, the online usage of vegan products has doubled in England and America since the first half of 2018. Tesla, a car manufacturing company, has started to use artificial leather rather than real leather due to the requirements of vegetarians. Moreover, the usage of artificial leather has increased in various businesses such as the shoe and car industries [13].

Although research on animal rights and animal welfare in the fashion industry is continuously increasing owing to the rise of social interest in ethical fashion, it is still far behind the research numbers of environmental and labor issues in the fashion industry [14]. Currently, vegan fashion attracts attention due to ethical fashion. Furthermore, global consumers' ethical awareness of animal protection and welfare has improved compared to the past. These results reflect the current fashion industry's reluctance to use fur or leather products in line with the improvement of ethical awareness [15].

Meanwhile, although vegan material satisfies the aspect of animal ethics, the dilemma of the production and disuse of composite materials causing environmental pollution has continued to raise concerns [16]. Therefore, under the category of ethical fashion [10], this study aims to determine consumers' relationship and interests in artificial fur and leather, considering both the environment as well as animals. Furthermore, this study plays a significant role in revealing consumers' overall interest and awareness of the dilemma of using vegan fashion materials.

This study's primary aim is to investigate consumers' past and present general awareness of the existing animal materials and the alternative materials, and to determine how the interest in animal and environmental rights influence interests in vegan materials. Based on the aforementioned and with regard to the social phenomenon, this study examines the following:

1. Global consumers' past and present awareness of fur and artificial fur
2. Global consumers' past and present awareness of leather and artificial leather
3. The relationship between interests in animals and animal welfare and interests in vegan materials
4. The relationship between interests in the environment and eco-friendly and interests in vegan materials

2. Theoretical Background

2.1. Vegan Fashion and Materials

Vegan fashion uses artificial or eco-friendly materials rather than animal materials such as leather, fur, silk, and wool. The representatives of vegan materials in vegan fashion include acrylic, bamboo, cotton, hemp, jute, linen, modal, nylon, ramie, rayon, and spandex. Banned materials such as angora, cashmere, fur, suede, nubuck, patent leather, chamois,

calfskin, shearling, silk, snake leather, lizard leather, and wool come from animals [17]. Several studies have defined vegan fashion as not using animal raw materials and included it in the category of ethical fashion [16,18–20]. Yoh [18] concretely states that vegan fashion does not include animal materials such as leather, fur, wool, silk, and duck fur, among others, and animal experiments during the process of production. With regard to the vegan-fashion-consuming phenomenon, Choi and Lee [19] state that it is a clothing consumption phenomenon where the concept of vegetarianism is applied to garments due to an increase in awareness about environmental and animal care that does not promote the use of animal leather or fur. According to Choi and Yoh [20], most vegan fashion brands use eco-friendly or recycled materials such as organic cotton, recycled fiber, artificial leather or suede, and cotton canvas. Moreover, Kim and Park [21] categorize the alternative materials of vegan fashion mainly into the leather, fur, and other alternatives.

Choi and Lee [19] investigated the meaning of veganism as recognized by fashion and beauty consumers and confirmed that the keywords “veganism philosophy”, “eco-friendly”, and “philanthropic” appeared as the ethical consumption aspect. Moreover, they proved that vegan fashion can include a sub-conception of ethical fashion. In another research, Choi and Lee [22] found that vegan and halal beauty have common meanings in terms of the use of non-animal materials, the considerations of animal and environmental ethics, and a safe ingredient. They also [23] found that vegan fashion, ethical fashion, and companion animal’s fashion have common meanings in terms of animal ethics, brands, and materials. These approaches were based on attempts to associate vegan fashion with ethical fashion.

In addition, Stringer, Mortimer, and Payne [24] found that self-transcendence values and openness to change values have a positive impact on consumers’ levels of ethical concern toward animal welfare, the environment, and worker welfare concerns within the fashion industry. Besides, the results included that a consumer’s level of concern toward animal welfare and the environment positively influences their likeliness to purchase ethically marketed fast fashion. Yoh [18] explored the determinants of purchase intentions for vegan fashion products based on the modified planned behavior model. The intention of purchasing vegan fashion products was determined by attitude, subjective norms, ethical responsibility, and ethical identity of the consumers.

Seo and Suh [25] analyzed vegan fashion marketing strategies as social value activities of global fashion brands H&M and Zara. Both companies emphasized the importance of recycling, production and waste disposal activities, encouraging ethical consumption and sustainable consumer participation, developing corporate financial activities based on shared values, and establishing a collaborative ecosystem with luxury designers and brands. Accordingly, Lee, Karpova, and Bayter [8] confirmed how different types of information influenced college students’ attitudes and subjective norms toward purchasing fashion products made of fur, leather, and wool. As a result, participants’ attitudes and subjective norms of purchasing fashion products made of fur, leather, and wool varied greatly depending on the type of information that they were exposed to. For fur and leather, both one-sided positive and negative messages were significantly more effective than the balanced two-sided messages in the respective intended direction.

2.2. Related Studies

Artificial fur is suggested as the representative of alternative material in vegan fashion. In the past, artificial fur was used as an alternative for cheap, natural fur, but owing to the development of production technologies, the quality of artificial fur, including its texture and gloss, has improved; thus, artificial fur has become the main alternative material in vegan fashion [21]. Furthermore, artificial fur is manufactured using fur containing artificial fiber similar to the fur of knitted floor covers. The manufacturing process is simpler than that of natural fur. Moreover, artificial fur has several advantages; for instance, it can be easily dyed, stored, and washed and has a low production cost [26]. It is also highly favored among younger generations who take more care of the environment and

pay more attention to fashion [27]. Although artificial fur raises the dilemma of causing environmental pollution during the production and disusing process since the raw material is petroleum [16], several researchers still consider it ethical fashion as it solves unethical problems such as animal abuse and cruel slaughters.

A few studies have revealed the factors that influence consumption awareness and behaviors pertaining to the purchase of artificial fur products. Jung and Oh [28] analyzed the relationship between ethical consumption beliefs and eco-friendly artificial leather clothing attitude, finding that all four aspects of ethical consumption beliefs, namely social responsibility, eco-friendly consumption, animal welfare, and personal improvements, were positively related to artificial leather clothing. Kim and Kwon [29] stated that while altruistic consumers recognize artificial fur as the alternative material for natural fur and do not want artificial fur to look like natural fur, egoistic consumers prefer artificial furs that look similar to natural fur, which looks rich and plush, leading to the recognition of artificial fur as a material not related to natural fur. Lee and Choi [26] compared and analyzed the factors that influence the consumption of natural and artificial fur products among women consumers and found that rarity value and fur familiarity had a positive influence on both natural and artificial fur; subjective norm had a negative influence on the purchase intention of natural fur while showing a positive influence on artificial fur's purchase intention.

Rolling et al. [30] focused on the issue of cognitive dissonance among millennial consumers. Consumers experienced more cognitive dissonance for luxury brands with a pro-animal fur stance and showed a negative attitude toward the brand. Regardless of the product's hedonic or utilitarian purpose, the brands with a pro-faux fur stance created less conflict in consumers' minds than those with a pro-animal stance. Consequently, the use of animal fur in merchandising stigmatizes the brands. Shin [7] reported that whether or not the fake fur products resemble real fur, purchase intention is affected regardless, in addition to it not increasing. Accordingly, perceived stigma was considered as a factor that could affect social risks (social rejection). From a product developer point of view, alternative fur materials expand the types of raw materials in the design process [31].

Vegan leather is processed via plastic-based polyurethane chloride (PVC) and polyurethane or natural ingredients such as cork, pineapple leaves, and apple skin instead of cowhides and sheepskin [13]. Moreover, vegan materials such as fake fur and fruit leather are steadily being managed and developed as new materials [32]. It should be noted that not much research has been conducted on artificial leather in the aspect of ethics. Hamilton [33] considers not using leather products as a queer subculture and accompanies the joy of attachment and care between humans and animals whose skin is being used as leather products.

2.3. Environment and Usage of Vegan Materials

Vegan fashion prohibits all materials manufactured via animal abuse or animal exploitation, only allowing composite and plant materials instead of leather and fur materials [17]. Most studies state that vegan fashion emphasizes animal protection by prohibiting animal experiments and is related to other ethical aspects such as eco-friendly and social responsibilities [14,19]. Artificial fur is categorized as an ethical fashion product directed toward animal welfare since it replaces animal fur; moreover, the consumption of artificial fur—termed as ethical consumption—is judged as having the value of preserving the ecosystem and protecting animals [27]. Since vegan fashion is considered the lower boundary of ethical fashion [10,19,29], artificial fur and leather being used as materials in vegan fashion can also be considered as being related to animal welfare, the improvement of animal rights, and the protection of animals and their ecosystem [29].

Fashion consumers who consider the environment's importance have reduced clothing consumption; conscious fashion companies try to reduce the use of chemical dyes [24,34]. Certain studies show that awareness of eco-friendly and social responsibility is included in the consumers' awareness of vegan fashion [19]. Nevertheless, there are often conflicting opinions. Further, vegan fashion solves environmental issues caused by the production

and disuse of composite materials for authentic fur and leather products [16]. However, the first dilemma arose from the eating habits associated with veganism; some environmental ethicists have claimed that vegetarianism causes harm to the environment and that if people give up the consumption of meat and choose vegetarianism, the population will increase dramatically due to surplus food sources, which causes a threat to the ecosystem [35]. Moreover, other environmental ethicists state that vegetarians claim to quit eating meat produced in factory farms, ignoring the fact that they are eating plants produced through mechanical and chemical manufacturing methods [36].

However, not all environmental ethicists criticize veganism. For example, if consumable food such as corn and beans are provided to cows to improve the quality of meat, then the problem of human starvation cannot be solved; therefore, from this perspective, a decrease in animal breeding is also present [37]. According to Kim [36], animal ethicists state that the imperativeness of the eating habits of veganism is for animal rights and welfare, whereas environmental ethicists state that it is for environmental issues that might occur due to the breeding of animals. If this is applied to fashion, indiscreet usage of animal materials will increase the demand, thereby leading to an indiscreet rise in animal stock, such as cow, pig, mink, raccoon, duck, ostrich, and sheep, to obtain fashion materials. Therefore, no matter which opinion states that producing fiber and cultivating raw cotton to replace animal materials will cause environmental pollution, environmental issues might also occur due to an indiscreet increase in stock to obtain animal materials; furthermore, the confrontation with the usage of animal material and vegan material will persist.

While the faux fur industry has promoted itself as eco-friendly, scientists have found that plastics also harm the environment and eventually kill animals. Tsunoda [5] criticized the usage of plastic-based materials in vegan fashion, while the fur industry has been criticized for killing animals. Jeong and Kwon [16] also stated that environmental pollution due to the use of synthetic fibers is another dilemma related to vegan fashion products. If vegan fashion is considered an extended concept of veganism [19], the environmental dilemma that arises from vegan fashion is inevitable. In the perspective of environmental ethics, the dispute pertaining to vegan fashion is continuously debated, with varying opinions regarding the concept of vegan fashion; there are ethical responsibilities of protecting the earth, ecosystem, and humans from various toxic materials produced by the livestock industry, the production and processing of materials, and the growing process of plant materials [10,19].

3. Research Methodology

3.1. Research Design

Previous research related to vegan fashion and alternative materials, case studies, and/or survey data statistical analysis were conducted for the empirical study. As an alternative approach, this study incorporated the macroscopic data from online sources such as social media and Google search. With the development of the Internet, public opinion about social phenomena is well illustrated in social media posts and used as an alternative way of collecting data [22]. In order to transform such unstructured data into structured data, methodologies such as text mining, social network analysis, and sentiment analysis are used. Google data also give insights into the volume of the online mentioning of keywords [22,38]. Since the data represents the number of keywords used online, a quantitative analysis was conducted. Therefore, this study utilized twofold empirical methods: one using social big data (*Tf-idf* value), the other using keywords volume (PLS-SEM).

As consumers' ethical awareness of animals has increased [2,30], their public opinion on social media is also expected to be different compared to the past. As a prior study, Choi and Lee [19] used text mining and social network analysis to prove that ethical perceptions of consumers in the past and present have changed. However, the study only addresses the differences between vegan fashion and vegan beauty. This study specifically focused on artificial fur and artificial leather, which are the materials used for vegan fashion. This

study focused on the change in consumer awareness on the use of animal nature materials (fur and leather) versus alternative vegan materials (artificial fur and leather). For this purpose, past and present social big data was compared.

Prior research detected the formation of a static relationship between consumers' ethical awareness and attitude/behavior toward fashion products [2,18,39]. Recently, the fashion industry has tended not to use fur or leather products to cope with the consumers' increasing ethical awareness [15], leading to an increase in the use of alternative materials instead of fur and leather, as mentioned in many news articles [40,41]. Since using vegan materials is a method of practicing ethical fashion [19], it can be assumed that there is a relationship between consumers' ethical interests in animal and environment and that in vegan materials. Although the environmental ethics sometimes contradict animal ethics [16], it is overall considered as a sub factor of ethical fashion. Therefore, it can also be assumed that it shows a relationship between interests in the environment and in vegan materials.

Thus, this study proposed the following hypotheses:

Hypothesis (H1): Consumers' interest in animal rights will positively influence their interest in products made of artificial fur.

Hypothesis (H2): Consumers' interest in animal rights will positively influence their interest in products made of artificial leather.

Hypothesis (H3): Consumers' interest in the environment will positively influence their interest in products made of artificial fur.

Hypothesis (H4): Consumer interest in the environment will positively influence their interest in products made of artificial leather.

Figure 1 illustrates the main variables and hypotheses of the empirical study.

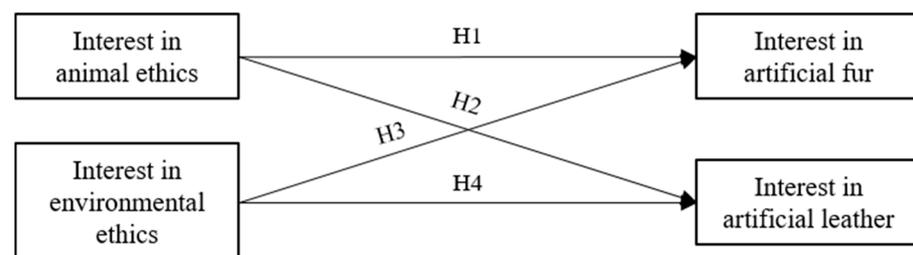


Figure 1. Initial conceptual model.

3.2. Social Big Data Analysis

This study uses Google Trends to determine exactly when the search volume of artificial fur exceeded the volume of mink and natural fur, setting it as the time of the standard of change in awareness. In Google Trends, the search volume of “fake fur” worldwide exceeded the search value of “mink” and “real fur” in December 2013. Thus, this study considered December 2013 as the basis to set the past (1 January 2008–31 November 2013) and future (1 December 2013–31 December 2019) accordingly. As such, vegan materials use various words such as “artificial”, “fake”, “faux”, “vegan”, “eco”, or “vegan” as the prefix of fur and leather. Google Trends was used in this study to determine the keywords with the highest search volumes: “fake fur” and “fake leather”. The channels used to collect data were worldwide communities like Google and Twitter; Python 3.7 was used for data analysis. A total of 9810 cases were collected for fur; 5413 for fake fur; 7609 for leather; 9110 for fake leather.

Instead of frequency, the top 30 keywords were selected based on the *Tf-idf* value, the algorithm of which represents the importance of a word in a file set. The importance of

a word is proportional to the number of times it appears in the document and inversely proportional to the number of times it appears in the entire document set [42]. The *Tf-idf* weighting stands for *term frequency* (*tf*) \times *inverse document frequency* (*idf*). Given a collection of terms $t \in T$ that appear in a set of N documents $d \in D$, each of length n_d , *Tf-idf*, then weighting is computed as follows [43] (Equation (1)).

$$\begin{aligned} tf_{t,d} &= \frac{f_{t,d}}{n_d} \\ idf_t &= \log \frac{N}{df_t} \\ W_{t,d} &= tf_{t,d} \times idf_t \end{aligned} \quad (1)$$

3.3. PLS-SEM Analysis

3.3.1. Preliminary Investigation

This study employed a macroscopic perspective to measure consumers' level of interest, which is measured by the search volume of a specific keyword in Google. After December 2013—set via the social big data analysis—the search volumes of every keyword from 1 December 2013 to 31 December 2019 were collected. In order to determine the overall level of interest of consumers, worldwide users were set as subjects. Accordingly, data was collected in weekly terms; data for a total of 73 weeks were used in the analysis. Subsequently, the Program Smart PLS 3.0 was used to determine the influence of the relationship between individual variables. In PLS-SEM, the sampling process was conducted at least 5000 times via the bootstrapping process, and the path coefficient and significance were confirmed.

The Google Trends analysis pertained to examining the use of words related to “animals”, such as “animal rights”, “animal protection”, “cruelty free”, and “animal welfare”, which were investigated to determine the consumers' level of interest in animals (Figure 2). It was found that the keyword “animal” had a dramatic surplus of search volume compared to other keywords. With regard to the study's context, the search volume of the keyword “animal” might cause debate due to its diversity. Therefore, it was excluded from the analysis; the keywords that had a high search volume in the Google Trends course of analysis following “animal” were “cruelty free” and “animal welfare” were set as the subject keywords.

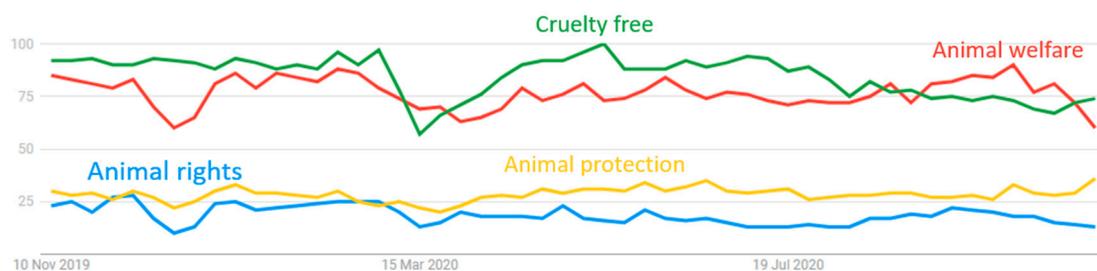


Figure 2. Trends in keyword search volume related to animals and animal rights.

The Google Trends analysis was conducted based on related keywords such as “eco” and “eco-friendly” to determine the consumers' interest level in environmental rights that contradict animal rights, including “animal”. As a result, the keywords “eco” and “environment” had a similar amount of search volume, so both were set as the subject keywords (Figure 3). For the consumers' level of interest in artificial fur and artificial leather, including “fake fur” and “fake leather” set in social big data analysis before, “vegan fur” and “vegan leather”—which have similar meanings—were set as subject keywords. Thus, this study proposed the modified conceptual model shown in Figure 4.

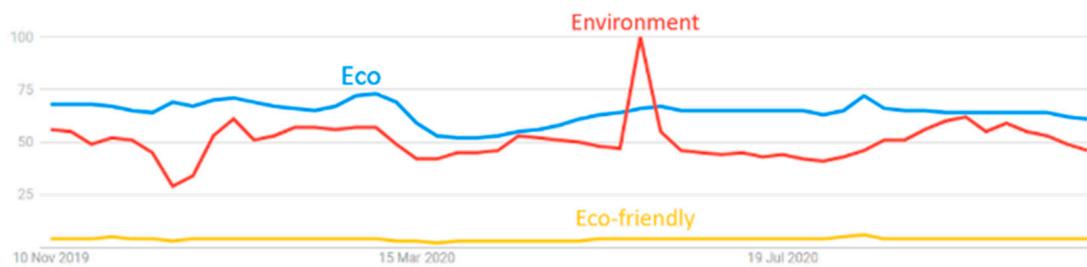


Figure 3. Trends in keyword search volume related to the environment and eco-friendliness.

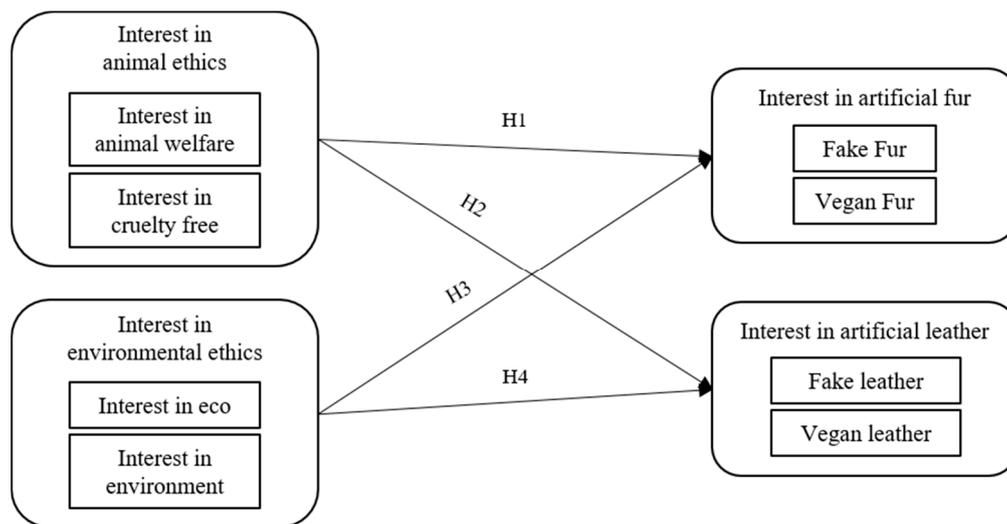


Figure 4. Modified conceptual model.

3.3.2. Reliability and Validity

For PLS-SEM, multi-collinearity among variables was checked; VIF of 1.00 indicated no significant multi-collinearity issue. Outer weights and outer loading did not contain 0 within the confidence interval, therefore considered significant. Furthermore, the variance explained by the endogenous variable was assessed through R^2 . Usually, R^2 above 0.20 [44,45] were used for the term “well explained”. In this study, the R^2 for vegan leather and vegan fur were 0.65 and 0.33 respectively, indicating that the variables were well explained by exogenous variables. However, the R^2 of fake fur ($R^2 = 0.10$) and fake leather ($R^2 = 0.04$) was 0.10 and 0.04 respectively, indicating that variables were not well explained by the given exogenous variables. The majority of the effect size (f^2) exceeded 0.02 [46]. As a result of blindfolding, the Q^2 of all potential endogenous variables appeared as a positive number larger than zero; hence, it has a high suitability of prediction. In this study, the latent variables were all composed of measurement variables that are single items.

4. Result and Discussion

4.1. The Change in Consumers' Awareness of Fur and Artificial Fur

The following result (Table 1) of collecting social big data and investigating the top 30 keywords selected in the standard of *Tf-idf* determines the changes in the consumers' awareness of fur and artificial fur. The top-ranked keywords related to animal rights before 2013 were “animal (*Tf-idf* = 1001.74)”, “truth (734.56)”, “ban (700.45)”, and “cruelty (363.97)”, showing that the issues about the reality and cruelty of the fur manufacturing process were raised between 2008 and 2013. After 2013, “artificial (2476.13)” became the main keyword of concepts related to fur, indicating that it started to attract attention as an alternative material. Apart from the keywords that appeared in the past, such as “animal

(1877.70)", "truth (987.46)", and "ban (743.73)", new keywords related to animal rights and animal abuse have appeared, such as "pain (686.77)", "animal protection (558.17)", "electric shock (535.14)", "nature (527.40)", "hunt (499.98)", "animal welfare (496.03)", "cruelty (472.14)", and "animal fight (464.01)". Accordingly, the concepts related to fur products—such as price, purchase, reform, and washing—formed the consumers' main awareness of fur; however, as time passed, the latter started to pay attention to the animal right assurance about animal abuse occurring during the process of manufacturing fur products.

Table 1. Top 30 keywords for fur and fake fur by *Tf-idf*.

Fur				Fake Fur			
Past		Present		Past		Present	
Word	<i>Tf-idf</i>	Word	<i>Tf-idf</i>	Word	<i>Tf-idf</i>	Word	<i>Tf-idf</i>
Mink	1194.09	Mink	3479.87	Winter	807.66	Size	1740.48
Animal	1001.74	Coat	3213.83	Material	763.96	Fake	1614.23
Price	1029.20	Reform	2601.43	Fashion	697.14	Coat	1599.31
Leather	954.62	Artificial	2476.13	Hair	656.17	Animal	1580.00
Sales	856.18	Price	2098.98	Coat	630.07	Price	1496.81
Winter	752.48	Winter	2033.15	Animal	608.59	Leather	1375.29
Truth	734.56	Animal	1877.70	Price	575.45	Winter	1344.17
Reform	767.23	Brand	1327.89	Style	535.65	Hair	1134.37
Ban	700.45	Leather	1270.40	Bag	520.62	Brand	1074.49
Hair	673.35	Image	1068.12	Color	494.07	Material	898.09
Washing	625.17	Truth	987.46	Love	488.69	Design	864.50
Jindo	585.21	Luxury	981.35	Luxury	459.54	Vest	720.26
Artificial	585.35	Weather	963.71	Size	432.91	Eco	673.34
Vest	539.65	Size	914.46	Design	415.86	Jacket	667.95
Discomfort	532.65	Fox	826.59	Care	414.15	Nature	630.86
Care	515.32	Vest	778.30	Lining	395.87	Keep warm	615.34
Coat	457.61	Ban	743.72	Rabbit	368.40	Real fur	593.41
Fashion	452.76	Jacket	719.55	Jacket	361.93	Mink	591.66
Rabbit	398.09	Pain	686.77	Animal Protection	351.84	Bag	540.79
Brand	380.85	Rabbit	685.23	Faux	347.56	Animal Protection	526.67
Fox	370.91	Mustang	683.27	Boots	334.26	Polyester	526.40
Design	364.38	Color	617.04	Chanel	326.84	High quality	515.66
Cruelty	363.97	Animal protection	558.17	Brand	316.82	Artificial leather	485.29
Store	337.34	Electric shock	535.14	Hat	315.17	Washing	466.36
Discount	350.60	Nature	527.40	Artificial leather	314.09	Care	454.94
Muffler	315.17	Hunt	499.98	Designer	311.28	Love	435.52
Style	302.81	Animal welfare	496.03	Washing	294.46	Vegan fashion	414.02
Dog	283.54	Cruelty	472.14	Mink	292.22	Ethics	362.22
Raccoon	274.52	Raccoon	472.08	Nylon	270.15	Environment	344.16
Luxury	261.26	Animal fight	464.01	Keep warm	266.61	Eco friendly	329.10

With regard to artificial fur, the keywords that appeared before and after 2013 included both “animal (608.59)” and “animal protection (351.84)”, but the factors related to the purchasing and pre-purchasing inspection of the products, such as “price (575.45)”, “style (535.65)”, and “color (494.07)”, among others, and the products that use artificial fur, such as “coat (630.07)”, “bag (520.62)”, “jacket (361.93)”, and “boots (334.26)”, including the “season (winter, 807.66)” to wear these appeared as the main keywords related to artificial fur. Meanwhile, after 2013, ethical and eco-friendly keywords such as “animal (1580.00)”, “eco (673.34)”, “nature (630.86)”, “animal protection (526.67)”, “vegan fashion (414.02)”, “ethical (362.22)”, “environment (344.16)”, and “eco-friendly (329.10)”, also appeared. As a result, consumers’ awareness of both natural and artificial fur showed a stronger relationship with concepts like animal rights, animal protection, and animal abuse than in the past.

4.2. The Change in Consumers’ Awareness of Leather and Artificial Leather

The following result (Table 2) of collecting social big data and investigating the top 30 keywords selected in the standard of *Tf-idf* determines the changes in the consumers’ awareness of leather and artificial leather. Although keywords such as “artificial (*Tf-idf* = 444.13)” and “nature (437.71)” appeared in the consumers’ awareness of leather before 2013, no keywords related to animals appeared in higher rankings; thus, it was difficult to say that artificial leather had been recognized as an alternative material for vegan fashion. It was better to mention it as a substitution of leather. After 2013, as keywords such as “vegetable (885.46)”, “animal (680.43)”, and “artificial (501.06)” appeared as the main keywords of leather; consumers’ awareness of alternative materials such as leather was assumed to have increased like in the case of fur.

Table 2. Top 30 keywords for leather and fake leather by *Tf-idf*.

Leather				Fake Leather			
Past		Present		Past		Present	
Word	<i>Tf-idf</i>	Word	<i>Tf-idf</i>	Word	<i>Tf-idf</i>	Word	<i>Tf-idf</i>
Bag	1023.75	Bag	2617.59	Sofa	1220.14	Price	1861.33
Craft	898.56	Making	2023.24	Price	1190.10	Loafer	1835.41
Seat	844.65	Glove	1893.20	Color	857.11	Bag	1669.63
Case	770.14	Wallet	1838.34	Real leather	832.86	Smell	1628.83
Price	763.45	Atelier	1721.11	Seat	811.26	Seat	1571.38
Jacket	671.10	Sofa	1504.99	Bag	761.66	Sofa	1542.39
Bracelet	657.00	Jacket	1414.43	Black	651.36	Black	1439.00
Brand	517.57	Case	1172.82	Size	610.34	Color	1419.03
Care	457.26	Gift	1151.56	Jacket	491.57	Texture	1270.80
Artificial	444.13	Belt	1136.03	High quality	461.26	Real leather	1264.17
Nature	437.71	Price	1126.72	Material	371.97	Size	1263.43
Size	424.59	Size	1124.06	Chair	362.59	High quality	1037.63
Color	393.61	Cow	1038.93	Design	353.82	Washing	967.18
Sofa	385.30	Brand	1005.17	Case	341.33	Material	881.56
Design	375.15	Natural	970.67	Furniture	315.07	Design	794.92
Black	351.20	Cleaning	961.22	Reform	293.08	Case	711.32
Atelier	331.70	Cover	944.24	Enamel	292.80	Reform	704.14
Cow	314.65	Vegetable	885.46	Texture	281.94	Sneakers	564.90
Wallet	300.36	Craft	877.80	Fabric	269.94	Navy	553.06

Table 2. Cont.

Leather				Fake Leather			
Past		Present		Past		Present	
Word	Tf-idf	Word	Tf-idf	Word	Tf-idf	Word	Tf-idf
High quality	291.03	Color	872.60	Recommend	264.45	Wallet	547.85
Lamb	284.17	Design	860.51	Ivory	263.24	Brown	527.51
Couch	281.21	Black	769.85	Suede	253.53	Lining	516.07
Reform	264.86	Bracelet	760.29	Car	234.18	Leggings	490.13
Coordinate	262.76	Italy	750.70	Interior	224.60	Shoes	484.52
Brown	240.01	Genuine	736.15	Red	223.28	Care	468.85
Fabric	237.11	Animal	680.53	Smell	216.60	Flexibility	464.77
Dyeing	227.99	Loafer	638.89	Shoes	215.17	Cow	459.89
Winter	226.68	Shoes	625.46	Lining	209.76	Cost-effectiveness	426.53
Watch	211.04	Cleaner	609.08	Pattern	208.71	Brand	421.89
Autumn	209.75	Artificial	501.06	Brand	204.27	Animal	375.02

In the case of the consumers' awareness of artificial fur in the past, animal-related keywords did not appear as the main keyword; after 2013, "animal (375.02)" appeared as the main keyword in consumers' awareness, but all other keywords were about the price, item, color, or quality of artificial leather. Since artificial leather is often used as an industrial material, interest in it as an alternative material was low. Therefore, interest in this as an alternative material in vegan fashion has raised consumers' awareness of leather products but has shown a minor increase in the consumers' awareness of artificial leather, which is often used as an industrial material.

4.3. The Relationship between Interest in Vegan Materials and Consumers' Ethical Interests

4.3.1. The Relationship between Interest in Vegan Materials and in Animal Welfare and Cruelty-Free

After the conformity assessment, the worldwide Google keyword search volume of "animal welfare" and "cruelty free", which show interest in animal welfare, and the Google search volume of "environment" and "eco", which show interest in the environment, were set as the exogenous variables of this study. Furthermore, the Google keyword search volume of "fake fur", "fake leather", and "vegan leather", all of which show interest in artificial fur and leather, was set as the endogenous variable of this study (Table 3) (Figure 3).

Table 3. Direct path coefficient of animal interest.

Hypothesis	Path ^a	β	S.E.	<i>t</i>	Result
H1	H1a1 Animal Welfare → Fake Fur	0.22	0.11	1.98 *	Accepted
	H1a2 Animal Welfare → Vegan Fur	0.18	0.11	1.64	Rejected
	H1b1 Cruelty Free → Fake Fur	0.32	0.16	1.97 *	Accepted
	H1b2 Cruelty Free → Vegan Fur	0.40	0.17	2.30 *	Accepted
H2	H2a1 Animal Welfare → Fake Leather	0.22	0.11	1.92	Rejected
	H2a2 Animal Welfare → Vegan Leather	0.01	0.08	0.18	Rejected
	H2b1 Cruelty Free → Fake Leather	0.11	0.17	0.65	Rejected
	H2b2 Cruelty Free → Vegan Leather	0.37	0.16	2.28 *	Accepted

* $p < 0.05$, ^a Each keyword represents the Google search volume.

Global consumers' interest in animal welfare showed a significantly positive relationship with their interest in fake fur ($\beta = 0.22$), at the level of $p < 0.05$. Thus, as interest in animal welfare increases, interest in fake fur also rises. Meanwhile, a significant relationship with "fake leather", "vegan fur", and "vegan leather" was not shown. The interest in cruelty-free showed a significantly positive relationship with fake fur ($\beta = 0.32$, $p < 0.05$), vegan fur ($\beta = 0.40$, $p < 0.05$), and vegan leather ($\beta = 0.37$, $p < 0.05$), excluding fake leather. The keyword "cruelty free" showed more positive relationships with various vegan materials than the keyword "animal welfare". Thus, hypotheses H1a1, H1b1, and H1b2 were adopted and hypothesis H1a2 was rejected. On the other hand, except for hypothesis H2b2, all sub hypotheses in H2 were rejected.

Although the reason for this situation can be inferred in different ways, it is mainly due to the difference in the key issues of the realization of veganism in eating habits and fashion. Normally, from the perspective of vegan eating habits, the following two theories dominate: 1. the utilitarian animal liberation theory, which states that moral considerations should be made according to the capacity for suffering and enjoyment of animals [6], and 2. the animal rights theory, which is "right driven" and states that since human and animal have equal rights, one cannot be the means of the others' existence [47]. The two positions are different, but since animal welfare fulfills both the liberation and rights of animals, it is used as the main prefix related to vegan (i.e., "animal welfare eggs", and "animal welfare milk").

With regard to fashion and beauty, "cruelty free" is more often used as animal protection and in opposition against animal experiments [19]. Veganism in fashion also aims for animal welfare, but since the disapproval of cruel exploitation and slaughter in making fur or leather products is the predominant issue, "cruelty free" is considered a more related keyword than "animal welfare". Meanwhile, fake leather did not show a significant relationship with consumers' interest in animals, perhaps because it is often used as an alternative material to leather products, just as in the result of earlier social big data analyses, conducted before the appearance of vegan fashion.

4.3.2. The Relationship between Interest in Vegan Materials and in the Environment and Eco-Friendly

Global consumers' interest in the environment showed a significantly negative relationship with their interest in fake fur ($\beta = -0.26$, $p < 0.05$) and fake leather ($\beta = -0.30$, $p < 0.01$) (Table 4 and Figure 5). Thus, hypothesis H3b1 was adopted, whereas hypotheses H3a1, H3a2, and H3b2 were rejected. This result indicates that as consumers' interest in the environment increases, the interest in vegan materials, such as artificial fur and artificial leather, declines. Similar to the dilemma of vegan fashion, which has been mentioned in the advanced research [16], due to the environmental issues raised following the production and disuse of composite materials, there is a confrontation between vegan materials and environmental issues.

Table 4. Direct path coefficient of environmental interest.

Hypothesis	Path ^a	β	S.E.	<i>t</i>	Result	
H3	H3a1	Eco → Fake Fur	0.03	0.17	0.17	Rejected
	H3a2	Eco → Vegan Fur	0.24	0.20	1.17	Rejected
	H3b1	Environment → Fake Fur	-0.26	0.11	2.24 *	Accepted
	H3b2	Environment → Vegan Fur	-0.23	0.13	1.71	Rejected
H4	H4a1	Eco → Fake Leather	0.13	0.16	0.80	Rejected
	H4a2	Eco → Vegan Leather	0.49	0.18	2.68 **	Accepted
	H4b1	Environment → Fake Leather	-0.30	0.10	2.78 **	Accepted
	H4b2	Environment → Vegan Leather	-0.15	0.10	1.45	Rejected

** $p < 0.01$, * $p < 0.05$, ^a Each keyword represents the Google search volume.

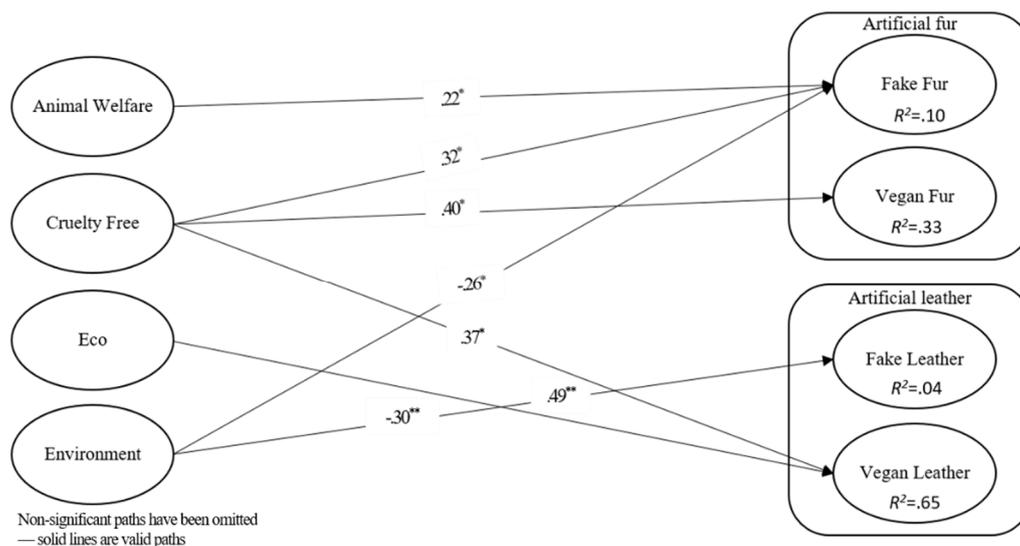


Figure 5. Results of PLS-SEM path analysis.

On the other hand, the interest in “eco”, which means environmentally friendly, showed a positive relationship with the interest in vegan leather ($\beta = 0.49$) at the level of $p < 0.01$ and indicated a high power of explanation. Thus, H4a1 and H4b2 were rejected, whereas H4a2 and H4b1 were accepted. It can be assumed that this is because of the difference of semantics between fake leather and vegan leather.

Vegan leather is composed of artificial leather and plant leathers, such as pineapple leather, mushroom leather, and wine leather, which can be naturally decomposed [48]. “Vegan leather” attracts more attention to environmental factors than “fake leather”. Therefore, as consumers’ interest in eco-friendly increases, the interest in vegan leather also rises.

5. Conclusions

Currently, as ethical awareness has improved worldwide, consumers have become increasingly aware of the environmental and social issues associated with the fashion industry [49,50]. Vegan fashion that does not include cruel slaughter and animal exploitation attracts much attention. The rise of interest in vegan fashion has led to an increase in interest in vegan materials, and artificial fur and leather are recognized as alternative materials to animal fur and leather. Through reflecting upon such a social phenomenon, this study compares past and present consumers’ awareness of both artificial fur and leather that are alternative materials to existing animal fur and leather. Then it analyzes the relationship with ethical keywords according to the Google keyword search volume development. The results of the study are summarized in the following paragraphs.

First, the investigation of consumers’ awareness of fur and leather products, which represent animal materials, revealed that with time, consumers have started to relate concepts like animal rights, animal abuse, and animal protection, among others, to fur and leather products. The tendency of recognizing vegan materials such as artificial fur and leather as alternative materials has increased, while in the case of artificial leather the increase has been quite passive since it is also being used in other industries. Nevertheless, in the case of artificial fur, the ethical concepts related to the environment and animals appear to be the main components of main consumers’ awareness. Overall, consumer interest in vegan fashion’s alternative materials has increased and animal ethical awareness of fashion consumers has improved.

Second, as ethical interest in animal welfare increased, the interest in fake fur has also grown, and as interest in cruelty free increased, interest in fake fur, vegan fur, and vegan leather, excluding fake leather, has also augmented. On this basis, the keyword “cruelty fur” was more related to various vegan materials than the keyword “animal welfare”. Third, as consumer interest in the environment increased, the interest in vegan materials such as

fake fur and fake leather has instead decreased. On this basis, similar to the dilemma of vegan fashion, it is clear that vegan material is still in confrontation with environmental issues. On the other hand, as interest in eco increases, interest in vegan leather has also been augmented because vegan leather is composed of plant leathers that can be naturally decomposed, which attracts more attention to its environmental significance. Besides, these results are in line with the current shift from the use of animal fur in the fashion industry [2].

This study suggests the following marketing implications: First, the awareness of fake fur as a vegan material and ethical alternative material has increased compared to that in the past; however, fake leather is still recognized as an industrial material rather than a vegan material. Ethical consumers consider the environmental effect of purchasing eco-friendly products [39]. The dilemma regarding vegan fashion may lead to confusion among such consumers. However, many ethical consumers regard the environmental aspect as ethical fashion [51], with an increased preference toward and heightened purchase intention for eco-friendly products [39]. Therefore, the environmental dilemma of vegan fashion can affect its ethical identity. Ethical fashion companies must commit to changing consumers' awareness of vegan materials, especially artificial leather, positively. Second, in fashion, vegan materials have had a more significant relationship with "cruelty free" than "animal welfare". Thus, vegan fashion companies should emphasize "cruelty free" in their marketing activities. Third, although the usage of vegan materials is in opposition to environmental issues, which constitutes a dilemma, vegan leather has a positive relationship with consumers' interest in eco-friendly. Thus, leather as a vegan material, that is, "vegan leather", would be more appropriate to use than "fake leather".

The limitations of this study are as follows. The study tried to measure consumers' overall awareness and interests, using global consumer data, although due to the nature of macroscopic data the influence of noise could not be excluded. Future investigations will need to set concrete variables and improve accuracy and validity when inventing measuring tools. Additionally, certain terms derived from this study may assume different connotations over time, so it is necessary to design more resilient models with longevity as regards generalization.

Social big data analysis and Google trend analysis are effective in understanding consumer perception to a very large extent, as the macro data. But there are limitations in terms of accuracy and cleaning of words. This study tried to minimize errors in the generalization based on global data, although it is difficult to grasp consumers' specific and accurate perceptions about artificial fur and artificial leather. Limitations including noise of the data, which may include social data or Google trend data, cannot be ruled out. Only 30 keywords were regarded as important and used for the analysis, although there might be insights driven from keywords that showed lower *Tf-idf*.

Even though this research has the above-mentioned limitations, it is considered important because on a macroscopic level it confirmed changes in consumers' awareness of animal materials and alternative materials, and proved statistically that interest in the environment and animals is also related to interest in a specific language.

Currently, luxury brands that aim to incorporate sustainability into their business practice offer faux fur in their product assortments, specifically targeting environmentally-conscious millennial consumers [2]. Consequently, lots of fashion companies focus on creating alternatives to animal products, and this kind of action will certainly lead to an increase in sales and will change the existing public order. The invention of alternative materials is driven by the will for improving animal welfare and animal rights, and is a sustainable signal for aiming at a company's growth while also taking responsibility for the ecosystem. This study is considered academically significant because it provides insights on global consumers' ethical awareness and interests, which is an understudied topic.

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