Mining sustainable fashion e-commerce: social media texts and consumer behaviors

Zheng Shen[1]

Abstract

Sustainability in fashion e-commerce has attracted the attention of researchers because of its negative impact on the environment. After the advent of social media, sustainable fashion e-commerce is further challenged by the success of marketing practices and their impact on consumer behaviors. As a result, this study aims to positively affect consumer behaviors using social media texts in sustainable fashion marketing. It took a sustainable fashion brand named OnTheList as a case study, and examined its Facebook posts based on the mixed analysis of text mining and ANOVA. The results show that sustainability-related texts have a positive impact on consumers' liking and commenting behaviors, and price-related texts positively affect consumers' sharing and commenting behaviors. However, consumer behaviors are not significantly affected by social media texts related to brands and products. As such, the study contributes to the theoretical and managerial implications of current sustainable fashion e-commerce, especially in developing countries.

1 Introduction

The rapid development of fashion e-commerce has aroused scholars' attention to sustainable fashion in the field of marketing. Prior studies highlight that e-commerce provides a promising environment for the online sales growth of fashion companies [23]. Statistical reports show that global e-commerce sales in the fashion segment have increased by 7% compared to 2017, and are expected to grow to $200,131 m by 2023 [63]. Although fashion e-commerce has made a significant contribution to

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the world economy, scholars emphasize that it also has brought negative effects on the environment, such as water, air, agriculture and other environmental pollution [2]. To find solutions, scholars call for sustainable fashion marketing, and recent research mainly involves conceptualizing sustainable fashion [28], and its production and consumption [8]. According to Mukendi et al. [51], the academic literature has been slow in understanding sustainable fashion marketing, and it remains an underinvestigated area in fashion e-commerce.

In particular, there is a limited number of studies that have explored sustainable fashion marketing on social media [66]. The existing literature indicates that the sales growth of fashion e-commerce depends on technological and social changes [23]. Scholars argue that the lack of sustainable fashion visibility and access discourages consumers because they do not have the time, ability or desire to find sustainable fashion products [27, 53]. Correspondingly, it has been found that promoting sustainable fashion on social media can increase consumers' willingness to buy and positive attitudes towards brand images [14]. Social media is identified as an important channel to maintain the relationship between marketers and consumers, and to affect consumer behaviors in sustainable fashion marketing [34]. Recent studies reveal that sustainable fashion marketing continues to grow, and provides a sustainable future for fashion e-commerce [44]. Scholars believe that fashion companies are working hard on sustainable fashion marketing and its effective communication with consumers on social media, but there is a lack of case examples in the extant literature, especially concerning the communication efficacy of sustainable fashion brands [13]. As such, it is necessary to understand which type of social media messages are useful for promoting more sustainable fashion behaviors [51].

Considering the above issues, this study aims to positively affect consumer behaviors using social media texts in sustainable fashion marketing, and raises the following research question: *which type of social media texts can positively influence which consumer behavior in sustainable fashion marketing?* Accordingly, the study exemplifies a sustainable fashion brand named OnTheList, which offers a pioneering notion of keeping fashion sustainable with off-price luxury deals [62]. A total of 100 posts were collected from its Facebook business page and examined in two stages. First, keywords were extracted from these posts through text mining to classify types of social media texts and propose research hypotheses. Second, these hypotheses were tested using ANOVA based on the interaction between different text types and consumer behaviors. Finally, the results show that sustainability-related texts have a positive impact on consumers' liking and commenting behaviors, and price-related texts positively affect consumers' sharing and commenting behaviors. However, consumer behaviors are not significantly influenced by social media texts related to brands and products.

This study provides both theoretical and managerial implications. Theoretically, this study makes a two-fold contribution to the existing literature. For one thing, the results of previous research on sustainable fashion marketing are contradictory. For instance, some studies have repeatedly shown that consumers' attitudes towards the environment are critical to their intention to purchase sustainable fashion products [12], while other studies have argued that consumers do not consider environmental factors in sustainable fashion consumption [8]. The inconsistent findings indicate

the uncertainty between sustainable fashion circumstances and consumer behaviors. For this reason, this study specifies the types of social media texts and consumer behaviors to compensate for the limited understanding of sustainability-related fashion marketing on social media. For another, as mentioned above, the existing literature has not fully addressed effective practices for consumers to participate in sustainable fashion marketing. Although previous research has discussed several cases in this field, they have focused on the analysis of developed Western markets [51]. It is critical to explore e-commerce to promote sustainable fashion marketing in developing countries, which may have different consumers' perception and behaviors of sustainable fashion marketing [66]. Therefore, this study tends to give insights into sustainable fashion marketing in developing countries and provide a general understanding of current sustainable fashion marketing through choosing OnTheList as the case study, because it has stores in Hong Kong, Singapore, Taipei and Shanghai. Managerially, this study provides relevant recommendations for the text practices of sustainable fashion marketing on social media. Fashion marketers and managers can reconsider take full advantage of various types of social media texts to increase consumer participation and purchase intention in sustainable fashion marketing.

The remainder of the paper is structured as follows. The next section reviews the relevant literature on the impact of social media content on fashion e-commerce and the relationship between sustainable fashion marketing and consumer behaviors, and introduces the background of OnTheList. It is followed by the sections that discuss the methodology, propose four hypotheses, and report the results. Finally, the paper summarizes the findings, implications and limitations of the study, and proposes future research directions for sustainable fashion e-commerce.

2 Literature review

2.1 The impact of social media content on fashion e-commerce

The emergence of social media has revamped fashion e-commerce. It brings a new method of interaction, communication and participation in fashion marketing [29]. Past literature in this area shows the effective influence of social media on fashion brands and consumer behaviors. Related research supports that social media has a positive impact on brand co-creation, brand loyalty and consumer participation [25, 38]. Hajli et al. [25] recommend developing brand strategies through social media because the social interaction between consumers and brands in the online community improves relationship quality and brand loyalty. Kamboj et al. [38] reveal that social media significantly affects consumer participation, which in turn influences brand trust and loyalty, and ultimately lead to have a positive brand images and purchase intentions. The importance of social media has prompted fashion companies to develop effective marketing content on social media. Several academic studies have noticed the impact of social media content on brands [9, 26]. With the democratization of content production, social media content can be used to build brand images, expand social networks, and influence consumer participation on social

media [47]. Hence, effective content increases brand visibility, drives traffic to websites, and helps educate and converts customers on social media [26].

These studies have been further driven by exploring patterns of social media content. Kang et al. [37] summarize a model of brand clustering based on names of cosmetic brands extracted from tweets. Also, Khan et al. [40] develop an algorithm for sentiment classification of tweets, and imply that social media content is crucial for marketers to understand consumers' attitudes towards brands and products. Although prior studies have analyzed the impact of social media content in fashion marketing, current studies are still insufficient. Barnes [5] emphasizes that studies on fashion-generated content is not only insufficient but also outdated due to continuous innovation and changes in format and technology. As the state of fashion e-commerce is changing, digital and fast, marketing practitioners should adopt new strategies in the digital paradigm because the old ones are no longer feasible [1]. McKinsey's annual report on the state of fashion in 2020 further shows that "attention-grabbing content will be key, deployed on the right platform for each market, using persuasive calls-to action and, wherever possible, a seamless link to checkout" [1, p. 5]. Therefore, more research on social media content in fashion e-commerce, especially in sustainable fashion marketing, should be considered.

2.2 Sustainable fashion marketing and consumer behaviors

Recent research has started to explore sustainable fashion marketing on social media [43], but this is still an underinvestigated area that needs further discussion [51]. The extant literature is divided into two perspectives. The first perspective relates to the use of mainstream retail and marketing methods to increase the impact of sustainable fashion, and the other one holds that sustainable fashion marketing is a transformative practice that challenges mainstream consumer culture [16]. For this study, only the first perspective is reviewed in detail here. It involves sustainable retailing [61, 66], green branding [8, 20], second-hand fashion [7, 32], reverse logistics [35, 59], and e-commerce [4, 67]. First, previous research on sustainable retailing is interested in analyzing consumer responses to the paradoxical characteristics of sustainable fashion marketing. Thomas' research [61] finds that consumers are suspicious of the sustainability efforts of fashion marketers. In a similar vein, Yang et al. [66] imply that consumers in developing markets are more price-sensitive about sustainable fashion marketing. Second, green branding stands out through its environment-friendly attributes, including ethical, eco-friendly, natural, organic and other characteristics [6]. Existing research supports a positive relationship between environmental concerns and favorable attitudes towards green products. For instance, Gam [20] indicates that consumer's perceptions of green brands are positively related to their sustainable behaviors through green awareness. However, these studies reveal an inconsistent summary of the relationship between green attitudes and consumer behaviors. Contrary to Gam's research, Brookshire and Norum [8] argue that consumers' willingness to pay for sustainable fashion products is negatively affected by their attitudes towards the environment, price and age.

Moreover, second-hand fashion e-commerce is a global trend in sustainable fashion marketing. Previous studies also reveal that the promotion of second-hand fashion changes consumers' buying behaviors. Both Beh et al. [7] and Hvass' [32] studies confirm that second-hand fashion marketing has a positive impact on consumers' purchase behaviors by increasing consumer loyalty. Further, reverse logistics refers to the process of returning fashion products that have to be reused or recycled [55]. Related studies involve the impact of the return policy on consumer behaviors and loyalty, and the impact of the policy on brand revenue. Regarding consumer behaviors, current studies substantiate that reverse logistics creates consumer loyalty by reducing consumer risks and transaction costs [35]. From the perspective of brand revenue, Shen's case study on H&M [59] illustrates that the return policy of fashion products promotes sustainable marketing sales.

Last but not least, sustainable fashion in e-commerce is growing with the development of technology. According to Yeung and Ang [67], current sustainable fashion in e-commerce includes two forms—traditional online marketing and blog marketing. Compared with traditional online marketing, they further believe that the current sustainable fashion in blog marketing is characterized by small scale, newly established, largely unregulated, and run by inexperienced young companies. For this reason, the number of relevant academic analysis is limited. These works focus on advising how to help small firms attract more consumers in sustainable fashion marketing. Effective strategies include positioning sustainable fashion as a social form, promoting fashion, and emphasizing the brand experience of sustainable luxury [4, 42]. On the grounds of these studies, Mukendi et al. [51] conclude that more analysis of different messages and longitudinal research on the effectiveness of different technologies will help formulate future branding strategies of sustainable fashion. Due to the importance of sustainable fashion marketing in this study, Table 1 gives a detailed summary of these studies. From the above discussion, it can be inferred that consumer behaviors are significantly affected by sustainable fashion marketing, however, relevant research, especially on social media, is not sufficient.

2.3 The case of OnTheList

In consequence, this study uses a sustainable fashion brand named OnTheList as a case study to gain insights into sustainable fashion marketing in developing countries. OnTheList is a sustainable brand founded by a French couple named Delphine Lefay and Diego Dultzin Lacoste in January 2016, and it currently has stores in Hong Kong, Singapore, Taipei and Shanghai. Noticing the lack of options for brands looking to dispose of excess stock, the couple are inspired to provide clothing and lifestyle goods of premium brands at discounted prices in stores and online. As mentioned previously, the current concepts of sustainable fashion involve eco-fashion [42], second-hand fashion [32], reverse logistics [35], reuse and recycling [59]. Scholars claim that sustainable fashion is still elusive and is not limited to these notions [28]. It can be considered to include various means by which fashion items or behaviors are perceived to be more sustainable [51]. In addition to the current understanding of sustainable fashion, OnTheList offers a pioneering notion

Table 1 Examples of the important studies on sustainable fashion marketing

Author(s)	Methods	Key findings
Beard [6]	Case study	The article concludes with a reflection on today's practical manifestations of marketing ecofashion as well as the challenges faced by fashion brands and consumers in the sustainability of ecofashion
Kim et al. [42]	Online survey	The study confirms the significant effects of the type of social norms and the level of environmental concern on eco-friendly consumers' purchase intention in the apparel market
Yeung and Ang [67]	Interview	The paper finds that blogshops in Singapore reverse the development path from conventional to online retailers, however, they are not regulated and operated by inexperienced entrepreneurs
Athwal et al. [4]	Bibliographical review	The review confirms that research on sustainable luxury is significantly underdeveloped, and proposes to examine sustainable luxury in future studies
Mukendi et al. [51]	Bibliographical review	The review calls for more analysis on different effects of messaging dimensions and consumer behaviors in sustainable fashion marketing

of keeping fashion sustainable by clearing past-season fashion merchandise at discounted prices. This practice can not only solve the waste of fashion, but also gain a broader consumer market in a sustainable way.

Moreover, luxury brands are seen as feeding themselves on the acquisition of scarce resources, such as gold, fur, leather and wool [21]. It thus far has received scant attention from sustainable development activists because they question whether luxury fashion is compatible with sustainability [39]. Prior studies find that luxury consumers have ambivalent attitudes, because they believe luxury fashion and sustainability are contradictory, especially in terms of sustainable social and economic harmony [48]. Therefore, OnTheList tends to offer an innovative solution to handle the contradiction between luxury fashion and sustainable development. For this reason, it is listed by the British magazine named Tatler as one of the Top 10 sustainable brands that shaped the fashion industry in the past decade [65]. The success of OnTheList is sufficient to inspire the current understanding of sustainable fashion marketing. The study thus selected it as a case study to enlighten effective communication between sustainable fashion marketing and consumer behaviors on social media.

3 Methods

3.1 Data collection and analysis

To create sample data, the study investigated the Facebook business page of OnTheList. Facebook is the leading social media platform, and researchers have chosen it to develop the right situation for conducting investigations [57]. Since OnTheList only has two types of social media accounts—Facebook and Instagram, this study selected Facebook instead of Instagram because it intends to investigate the social media texts of sustainable fashion marketing.

Accordingly, data were collected from the Facebook posts of OnTheList from May 2019 to May 2020, and analyzed using text mining techniques and ANOVA. It is clear from Table 1 that few articles apply text mining and ANOVA to analyze sustainable fashion marketing. However, they are valuable tools for conducting relevant research. According to Information Resources Management Association in the United States [33], using various text mining techniques to monitor social media texts is an indispensable tool for investigating fashion on social media. The existing literature highlights three reasons for employing text mining in fashion marketing: (1) extracting unknown and valuable information from text data; (2) discovering patterns by classifying texts; (3) reducing time and efforts for data exploration [64].

Additionally, ANOVA can be used to determine significantly statistical differences between group means in a sample. Previous research has applied ANOVA to identify the influential factors of consumer perceptions and luxury consumption in fashion marketing [31]. More importantly, it flexibly cooperates with other research methods. For instance, Sanchez et al. [58] use principal components analysis to identify the types of consumers' motivational values, cluster analysis to create a typology of Spanish fashion consumers, and finally ANOVA analysis

to connect the consumer typology with a typology of shopping styles. In a similar vein, this study applied text mining techniques to determine the text factors and form text types, and then used ANOVA analysis to link text types with consumer behaviors to answer the research question. The specific research process is shown in Fig. 1.

About mining social media texts from Facebook, supported by the methodological framework of Salloum et al. [57], this study first collected text data of posts through Facebook Graph API, which extracts public data from Facebook. Considering the word limit, each step is not described in detail here, because it can refer to Graph API Explorer Guide. Subsequently, the collected text data were examined by Natural Language Toolkit (NLTK) for tokenization and keyword extraction. The logic is to first separate text data into each word presentation (token), and this process is known as tokenization. Then, tokens are marked by word frequencies in text processing, and keywords are extracted according to the word frequencies. Figure 2 is exemplified for how tokenization and keyword extraction were handled in the study.

Keyword is a set of significant words in an article, which provides readers with a high-level description of texts [45]. Namely, it gives a compact representation of document content [56]. As a result, keywords can generate a summary of a document and track topics over time. For this reason, the study classified the texts of sustainable fashion marketing into different groups based on keyword extraction in text mining, and proposed corresponding hypotheses.
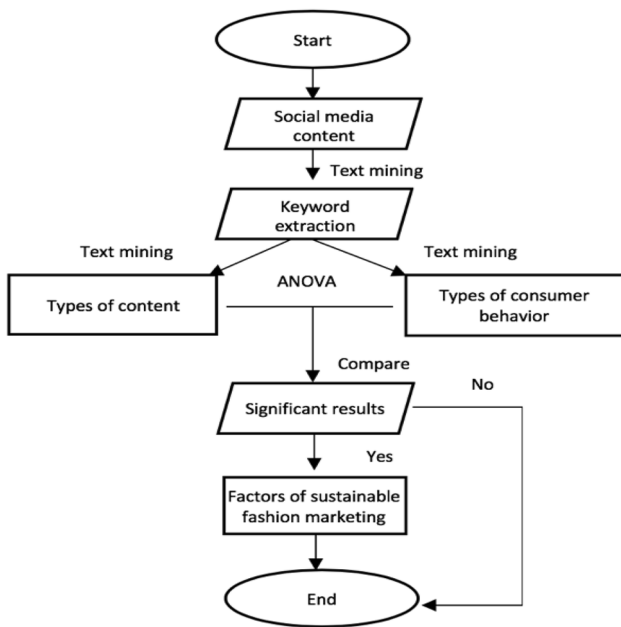

Fig. 1 The research process

```
>>> import nltk
>>> text="OnTheList Webinar Series Ep. 2. Expert Insights Into Sustainability In Beauty.Are you interested to know more
insights into sustainability in beauty world? Join our webinar tomorrow! An initiative by OnTheList, this webinar series
OnTheList Webinar Series: Experts Insights on Sustainability in Beauty aims to provide a conversational platform for tho
ught-leaders to voice their concerns, and share ideas and insights as to how various stakeholders can collaborate, educa
te and improve sustainability efforts in today's dynamic retail industry."
>>> nltk.word_tokenize(text)
['OnTheList', 'Webinar', 'Series', 'Ep', '.', '2', '.', 'Expert', 'Insights', 'Into', 'Sustainability', 'In', 'Beauty.Ar
e', 'you', 'interested', 'to', 'know', 'more', 'insights', 'into', 'sustainability', 'in', 'beauty', 'world', '?', 'Join
', 'our', 'webinar', 'tomorrow', '!', 'An', 'initiative', 'by', 'OnTheList', ',', 'this', 'webinar', 'series', 'OnTheLis
t', 'Webinar', 'Series', ':', 'Experts', 'Insights', 'on', 'Sustainability', 'in', 'Beauty', 'aims', 'to', 'provide', 'a
', 'conversational', 'platform', 'for', 'thought-leaders', 'to', 'voice', 'their', 'concerns', ',', 'and', 'share', 'ide
as', 'and', 'insights', 'as', 'to', 'how', 'various', 'stakeholders', 'can', 'collaborate', ',', 'educate', 'and', 'impr
ove', 'sustainability', 'efforts', 'in', 'today's', 'dynamic', 'retail', 'industry', '.']
>>> nltk.FreqDist(nltk.tokenize.word_tokenize(text))
FreqDist({'to': 4, '.': 3, 'and': 3, 'in': 3, 'OnTheList': 3, ',': 3, 'sustainability': 2, 'Webinar': 2, 'Sustainability
': 2, 'Insights': 2, ...})
```

Fig. 2 Mining social media text

3.2 Text classification and hypothesis development

A total of 300 tokens were initially extracted from OnTheList microblogs. The frequency range is 1 to 56. Extant literature shows that the keywords need to be reorganized based on frequency range for three reasons: (1) analysis of all keywords makes it difficult to interpret meaningful results; (2) keywords with too low frequency are not sufficient to understand the whole result; (3) keywords with too high frequency can distort the results of less important words [30]. In line with them, tokens with lower frequency (<4) in this study were cleared because they are insufficient to understand microblogs as a whole compared with the overall frequency. In consequence, 135 keywords were identified. Tokens with high frequency include "onthelist" (35), "check" (26), "shop" (25), "online" (25), "premium" (19), "new" (17), "collection" (15), "fashion" (13) and "otl"(13). Figure 3(a) visualizes them
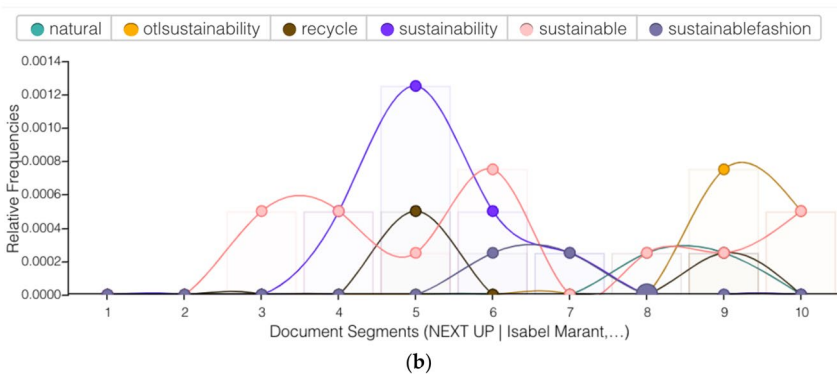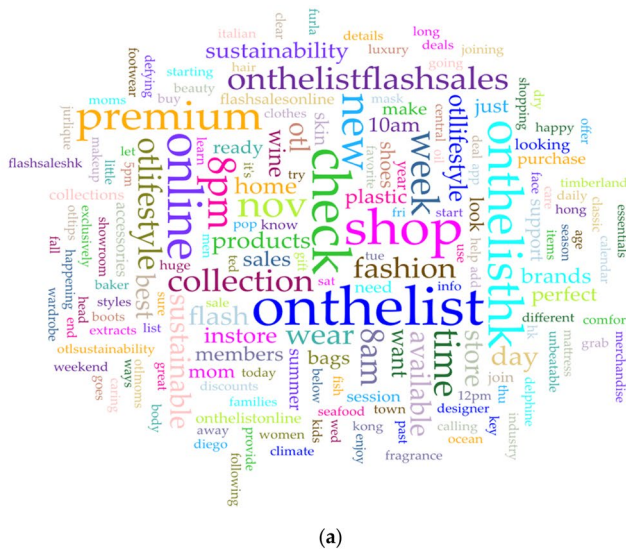

(a)

(b)

Fig. 3 **a** Keywords of OnTheList; **b** keywords related to sustainability

through a word cloud based on their frequency distribution. Among them, the key-words related to sustainability include "sustainability", "sustainable", "sustainable-fashion", "recycle", "otlsustainability" and "natural". The relative frequencies are shown in Fig. 3b.

According to the word frequency, these keywords were further categorized into different groups. Group 1 contains keywords related to sustainability such as "sustainability", "sustainable", "sustainablefashion", "recycle", "otlsustainability" and "natural". Group 2 consists of keywords related to brands such as "brands", "Timberland", "Ted", "Baker", "Tory", "Burch", "OnTheList", "Armani", etc. Group 3 is composed of product-related keywords, including "bags", "shoes", "skin", "accessories", "collections", "clothes", "hair" and so forth. Finally, Group 4 includes keywords related to price such as "luxury", "discounts", "offers", "80%", "off", etc. Therefore, four types of texts (related to sustainability, brand, price and product) appear in sustainable fashion marketing frequently. Accordingly, the study proposed the following four hypotheses:

> **Hypothesis 1 (H1).** Sustainability-related texts have a positive impact on consumer behaviors in sustainable fashion marketing on social media.
> **Hypothesis 2 (H2).** Brand-related texts have a positive impact on consumer behaviors in sustainable fashion marketing on social media.
> **Hypothesis 3 (H3).** Price-related texts have a positive impact on consumer behaviors in sustainable fashion marketing on social media.
> **Hypothesis 4 (H4).** Product-related texts have a positive impact on consumer behaviors in sustainable fashion marketing on social media.

3.3 Coding variables and procedure

Extant literature supports the use of likes, shares and comments as engagement measures of consumer behaviors in Facebook posts [11]. They are considered to be three tools for customizing company online messages to communicate with the public effectively [41]. Hence, the study applied them to the measure communication efficacy of sustainable fashion marketing between the four text types and consumer behaviors through ANOVA. Likes have been interpreted that consumers accept the perception of posts and hold positive attitudes towards brand images [3]. Compared with simply clicking the liking button, comments can be seen as a communication tool that helps marketers understand consumers in advance, because consumers need to spend more efforts to express their thoughts, attitudes and feelings when commenting [46]. Similarly, sharing requires high activation energy, and causes more feedback by allowing others to continue sharing in consumer networks [50]. Thus, this study considers the effectiveness of social media texts on consumer behaviors from the lowest to highest is liking, commenting and sharing.

Before the ANOVA analysis, variables were assigned to the four text types respectively. Based on the text mining results of text classification mentioned above, this study further looked into the corresponding posts containing relevant keywords in order to specify variables. First, sustainable-related texts are found to appear in the posts of OnTheList brand campaigns and news. According to prior studies [49,

69], through brand campaigns and news, powerful brand associations can be linked with consumers' memories of brands, thereby establishing positive brand images, which have a significant impact on consumer satisfaction and loyalty. Therefore, this study employed brand campaigns and news as predictive variables to investigate their effects on consumer behaviors in the context of sustainable fashion marketing. Second, the results of text classification show a number of brand names. Past research has provided us with important insights that brand names play a crucial role in branding and consumers' preference for products [24, 68]. For this reason, this study selected brand names as a predictive variable, and compared the difference between general, sustainable and no brand names in sustainable fashion marketing. Third, as evidenced by previous studies that price is a potential direct antecedent for consumers' purchasing behaviors [22, 52], this study tested whether it has the same effect in sustainable fashion marketing. Finally, past research has noted that product category affects the levels of brand influence on consumers and the relationship between consumers and brands [15, 19]. As a result, it is another predictive variable for this study. See Table 2 for details.

4 Results

To empirically research the effectiveness of social media texts on consumer behaviors in sustainable fashion marketing, a total of 100 posts were collected last year, and descriptive results were presented in Table 3. The results are explained in detail according to the four types of social media texts as follows.

4.1 Sustainability-related texts and consumer behaviors

Regarding sustainability-related texts, the overall analysis returns the statistically significant results of likes ($F = 8.447$, $p < 0.05$) and comments ($F = 9.641$, $p < 0.05$). Specifically, in terms of liking, the result of V2 is positive and significant (24.774, $p = 0.007$) compared with that of V1, indicating that sustainability-related texts in brand campaigns positively affect consumers' liking responses. Similarly, the result of V4 is positive and significant compared with that of V1(47.117, $p = 0.000$) and V3 (39.543, $p = 0.013$), supporting that sustainability-related texts in brand news positively influence consumers' liking responses. Namely, sustainability-related texts have a positive impact on consumers' liking behaviors. For shares, the result of V2 is positive and significant compared with that of V1 (1.021, $p = 0.016$) and V3 (1.400, $p = 0.043$), showing that sustainability-related texts also have a positive impact on consumers' sharing behaviors. Moreover, concerning the analysis of comments, the result of V2 is positive and significant compared with that of V1(3.088, $p = 0.000$) and V3 (3.400, $p = 0.001$), showing that sustainability-related texts positively affect the number of consumer comments. Further, the result of V2 is positive and significant compared with that of V4 (2.257, $p = 0.010$), indicating that sustainable brand campaigns have more influence on the number of consumer comments than sustainable news. All these results reveal that sustainability-related texts have

Table 2 Coding variables and definitions

Dimensions	Measure factors	Definition	References
Sustainability-related texts	General brand campaigns (V1)	Posts describe brand campaigns without linking to sustainability	Maheshwari et al. [49] and Zhang [69]
	Sustainable brand campaigns (V2)	Posts connect brand campaigns to sustainability	
	General brand news (V3)	Posts provide brand news without associating with sustainability	
	Sustainable brand news (V4)	Posts offer brand news related to sustainability	
Brand-related texts	General brand names (V1)	Posts describe brand names	Yorkston and Menon[68], Gunasti and Ross [24]
	Sustainable brand names (V2)	Posts specify sustainable brand names	
	Without brand names (V3)	Posts do not state brand names	
Price-related texts	Without prices (V1)	Posts do not mention product prices	Netemayer et al. [52] and Godey et al. [22]
	Discounted prices (V2)	Posts provide discounts and special offers	
	Specific prices (V3)	Posts specify product prices	
Product-related texts	Clothes (V1)	Posts only include clothing categories (e.g. dress)	DelVecchio [15] and Fetcherin et al. [19]
	Lifestyles (V2)	Posts involve a way of life (e.g. cookware)	
	Multiple product categories (V3)	Posts contain more than two product categories	
	Without product categories (V4)	Posts do not mention product categories	
Consumer behaviors	Likes (V1)	It indicates that consumers accept the perception of posts and have positive attitudes towards brand images	Kim [41] and Chwialkowska [11]
	Shares (V2)	It shows that posts not only have a positive impact on the behaviors of individual consumers, but also a positive influence on consumer behaviors in the same consumer networks	
	Comments (V3)	It means that consumers actively maintain consumer-brand relationships	

Table 3 Descriptive Statistics

	N	Minimum	Maximum	Mean	SD
Likes	100	1	271	12.24	29.648
Shares	100	0	7	0.87	1.267
Comments	100	0	12	0.67	1.964
Valid N (listwise)	100				

a positive impact on consumer behaviors, and thus H1 is supported. The specific results are recorded in Tables 4 and 5 below.

4.2 Brand-related texts and consumer behaviors

For brand-related texts, the ANOVA analysis return the results of likes (F = 1.482, p = 0.225), shares (F = 1.161, p = 0.329), and comments (F = 0.526, p = 0.666) (See Table 6). Due to p > 0.05, the results are statistically insignificant. That is to say, the final results indicate that brand names have no obvious impact on consumer behaviors. Consequently, H2 is not supported.

4.3 Price-related texts and consumer behaviors

Concerning price-related texts, the ANOVA analysis returns the statistically significant results of shares (F = 13.951, p < 0.05) and comments (F = 9.014, p < 0.05) (see Table 7). In detail, concerning shares, the results of V2 and V1 are positive and significant (1.279, p < 0.05), showing that price affects consumers' sharing behaviors. Similarly, V3 and V1 imply a positive and significant result (2.163, p < 0.05). It confirms that price affects consumers' sharing behaviors. There is no obvious difference between posts with discounted price and specific price in sharing because V2 and V3 do not reveal a statistically significant result. Likewise, V2 and V1 show a positive and significant result (1.263, p < 0.05) in consumers' commenting behaviors. Also, V3 and V1 reveal a positive and significant result (3.413, p < 0.05). The results

Table 4 ANOVA results of sustainability-related texts

		Sum of squares	df	Mean square	F	Sig.
Likes	Between groups	18,138.577	3	6046.192	8.447	0.000
	Within groups	68,001.605	95	715.806		
	Total	86,140.182	98			
Shares	Between Groups	10.389	3	3.463	2.239	0.089
	Within groups	146.904	95	1.546		
	Total	157.293	98			
Comments	Between Groups	88.223	3	29.408	9.641	0.000
	Within groups	289.777	95	3.050		
	Total	378.000	98			

Table 5 Post hoc results of sustainability-related texts

Dependent variable	(I) Variable	(J) Variable	Mean difference (I–J)	SE	Sig.	95% Confidence interval Lower bound	Upper bound
Likes	1	2	− 24.774*	8.993	0.007	− 42.63	− 6.92
		3	− 7.574	12.347	0.541	− 32.09	16.94
		4	− 47.117*	10.562	0.000	− 68.08	− 26.15
	2	1	24.774*	8.993	0.007	6.92	42.63
		3	17.200	14.654	0.243	− 11.89	46.29
		4	− 22.343	13.185	0.093	− 48.52	3.83
	3	1	7.574	12.347	0.541	− 16.94	32.09
		2	− 17.200	14.654	0.243	− 46.29	11.89
		4	− 39.543*	15.666	0.013	− 70.64	− 8.44
	4	1	47.117*	10.562	0.000	26.15	68.08
		2	22.343	13.185	0.093	− 3.83	48.52
		3	39.543*	15.666	0.013	8.44	70.64
Shares	1	2	− 1.021*	0.418	0.016	− 1.85	− 0.19
		3	0.379	0.574	0.510	− 0.76	1.52
		4	− 0.078	0.491	0.874	− 1.05	0.90
	2	1	1.021*	0.418	0.016	0.19	1.85
		3	1.400*	0.681	0.043	0.05	2.75
		4	0.943	0.613	0.127	− 0.27	2.16
	3	1	− 0.379	0.574	0.510	− 1.52	0.76
		2	− 1.400*	0.681	0.043	− 2.75	− 0.05
		4	− 0.457	0.728	0.532	− 1.90	0.99
	4	1	0.078	0.491	0.874	− 0.90	1.05
		2	− 0.943	0.613	0.127	− 2.16	0.27
		3	0.457	0.728	0.532	− 0.99	1.90
Comments	1	2	− 3.088*	0.587	0.000	− 4.25	− 1.92
		3	0.312	0.806	0.700	− 1.29	1.91
		4	− 0.831	0.689	0.231	− 2.20	0.54
	2	1	3.088*	0.587	0.000	1.92	4.25
		3	3.400*	0.957	0.001	1.50	5.30
		4	2.257*	0.861	0.010	0.55	3.97
	3	1	− 0.312	0.806	0.700	− 1.91	1.29
		2	− 3.400*	0.957	0.001	− 5.30	− 1.50
		4	− 1.143	1.023	0.267	− 3.17	0.89
	4	1	0.831	0.689	0.231	− 0.54	2.20
		2	− 2.257*	0.861	0.010	− 3.97	− 0.55
		3	1.143	1.023	0.267	− 0.89	3.17

*The mean difference is significant at the 0.05 level

Table 6 Results of brand-related texts and consumer behaviors

		Sum of squares	df	Mean square	F	Sig.
Likes	Between groups	3850.044	3	1283.348	1.482	0.225
	Within groups	82,290.138	95	866.212		
	Total	86,140.182	98			
Shares	Between groups	5.565	3	1.855	1.161	0.329
	Within groups	151.728	95	1.597		
	Total	157.293	98			
Comments	Between groups	6.172	3	2.057	0.526	0.666
	Within groups	371.828	95	3.914		
	Total	378.000	98			

Table 7 ANOVA results of price-related texts

		Sum of squares	df	Mean square	F	Sig.
Likes	Between groups	521.498	2	260.749	0.292	0.747
	Within groups	85,618.683	96	891.861		
	Total	86,140.182	98			
Shares	Between groups	35.422	2	17.711	13.951	0.000
	Within groups	121.871	96	1.269		
	Total	157.293	98			
Comments	Between Groups	59.763	2	29.881	9.014	0.000
	Within groups	318.237	96	3.315		
	Total	378.000	98			

imply that price has a positive impact on consumers' commenting behaviors. Different from consumers' sharing behaviors, V3 and V2 reveal a positive and significant result (2.150, $p < 0.038$) in this case. It further confirms that low price has a positive impact on consumers' commenting behaviors. The overall results substantiate that price, especially low price, has a positive and significant impact on consumer behaviors. Therefore, H3 is supported and the specific results are shown in Table 8 below.

4.4 Product-related texts and consumer behaviors

In terms of product-related texts, the study finds that V1 includes clothing categories such as children's wear, dress, work clothes, menswear, sportswear and more; and V2 consists of lifestyles such as champagnes, sparkling wines, suitcases and cookware. The ANOVA analysis return the results of likes ($F = 1.127$, $p = 0.342$), shares ($F = 2.501$, $p = 0.064$), and comments ($F = 0.312$, $p = 0.816$) (See Table 9). Since $p > 0.05$, the results are not statistically significant. In other words, the final results imply that product categories have no obvious impact on consumer behaviors. Consequently, the results cannot affirm H4.

Table 8 Post hoc results of price-related texts

Dependent variable	(I) Variable	(J) Variable	Mean difference (I–J)	SE	Sig.	95% Confidence interval	
						Lower bound	Upper bound
likes	1	2	− 5.942	8.403	0.481	− 22.62	10.74
		3	− 5.375	15.301	0.726	− 35.75	25.00
	2	1	5.942	8.403	0.481	− 10.74	22.62
		3	0.567	16.805	0.973	− 32.79	33.93
	3	1	5.375	15.301	0.726	− 25.00	35.75
		2	− 0.567	16.805	0.973	− 33.93	32.79
shares	1	2	− 1.279*	0.317	0.000	− 1.91	− 0.65
		3	− 2.162*	0.577	0.000	− 3.31	− 1.02
	2	1	1.279*	0.317	0.000	0.65	1.91
		3	− 0.883	0.634	0.167	− 2.14	0.38
	3	1	2.163*	0.577	0.000	1.02	3.31
		2	0.883	0.634	0.167	− 0.38	2.14
comments	1	2	− 1.263*	0.512	0.016	− 2.28	− 0.25
		3	− 3.412*	0.933	0.000	− 5.26	− 1.56
	2	1	1.263*	0.512	0.016	0.25	2.28
		3	− 2.150*	1.025	0.038	− 4.18	− 0.12
	3	1	3.413*	0.933	0.000	1.56	5.26
		2	2.150*	1.025	0.038	0.12	4.18

*The mean difference is significant at the 0.05 level

Table 9 Results of product-related texts and consumer behaviors

		Sum of squares	df	Mean square	F	Sig.
Likes	Between groups	2961.258	3	987.086	1.127	0.342
	Within groups	83,178.924	95	875.568		
	Total	86,140.182	98			
Shares	Between groups	11.515	3	3.838	2.501	0.064
	Within groups	145.778	95	1.535		
	Total	157.293	98			
Comments	Between groups	3.692	3	1.231	0.312	0.816
	Within groups	374.308	95	3.940		
	Total	378.000	98			

5 Discussion and conclusions

To answer the research question, the study first classified the Facebook posts of OnTheList into four types, and then analyzed the effectiveness of four-type texts on different consumer behaviors. Consequently, the study finds that sustainability-related texts have a positive impact on consumers' liking and commenting behaviors, and price-related texts positively affect consumers' sharing and commenting behaviors.

However, consumer behaviors are not significantly influenced by social media texts related to brands and products.

5.1 Theoretical implications

Theoretically, this study makes a two-fold contribution to the existing literature. First, extant research on sustainable fashion marketing has inconsistent findings on the effective communication between sustainable fashion marketing and consumer behaviors. Hence, the study employed text mining and ANOVA to help understand, and empirically contributes to the existing literature by revealing which type of social media texts can effectively influence which consumer behaviors in sustainable fashion marketing. The final results are inconsistent with the previous findings, which emphasized brand names and product categories can positively affect consumer behaviors [19, 24]. The results of this study indicate that they have no significant impact on consumer behaviors in sustainable fashion marketing. Likewise, the study is contrary to the extant literature, which states that fashion consumers are willing to pay higher prices for eco-products [17, 60]. Instead, the results support previous research [66], and imply that consumers of sustainable fashion are price-sensitive and they prefer discounted and low prices. In particular, the study substantiates that sustainable-related texts positively affect consumer behaviors, which contradicts the findings of prior studies [3, 36]. It further discovers that this text type can increase consumers' liking and commenting behaviors. Hence, this study provides new insights for understanding the social media communication between sustainable fashion marketing and consumer behaviors.

Second, since prior studies have not yet fully addressed the empirical connection between the messaging dimension and consumer behaviors [11], this study supplements the existing literature by exemplifying OnTheList to provide a detailed understanding of current sustainable fashion marketing, especially in developing countries. Research on brand examples in sustainable fashion marketing remains an underdeveloped area [51]. In particular, it is important to explore sustainable fashion marketing in developing countries, which may lead to different findings on consumers' perceptions and behaviors of sustainable fashion marketing [66]. Previous research has focused on relevant discussions in developed Western markets [51]. For example, Ritch [54] believes that the concept of sustainability has been transferred to British fashion, and finds that consumers are suspicious of environmental issues and higher prices in sustainable fashion, which have affected consumer decision-making. Taking into account the regional differences, this may explain one of the reasons for the difference between the results of prior studies and this study. Therefore, this study not only tends to give insights into sustainable fashion marketing in developing countries, but also contributes to offering a general understanding of current sustainable fashion marketing on social media.

5.2 Managerial implications

Also, the study provides managerial insights for marketers of sustainable fashion brands and even general companies. Marketers should make full use of the effects of

different social media texts. For one thing, the study shows that sustainable-related texts can positively affect consumers' liking behaviors. As mentioned earlier, liking is critical to identifying potential target audiences, because it means interests of users, acceptance of the posting texts, and a positive attitude towards brand images [3]. For this reason, marketers are advised to post more texts related to sustainable fashion campaigns and news to identify potential consumers and build a sustainable brand image.

For another, this study indicates that both sustainability-related and price-related texts have a positive impact on consumers' commenting behaviors. Comments enable marketers to know consumers' thoughts, attitudes and feelings in advance [10]. Hence, marketers are encouraged to post more texts related to label discount information, emphasize low price, hold sustainable fashion campaigns, and issue sustainable fashion news to increase consumers' commenting behaviors. Additionally, this study also confirms that price-related texts can positively influence consumers' sharing behaviors. Namely, marketers are able to increase the impact of sustainable fashion marketing through posting price-related texts, because it not only positively affects direct consumer followers of brands but also positively affects other followers in the same consumer networks. Finally, the study suggests that marketers reduce or avoid posting texts related to brands and products, because the findings show that they have no significant impact on consumer behaviors in sustainable fashion marketing.

5.3 Limitations and future research directions

The study is subject to several limitations, which provide insights for future research. The first limitation is that this study applied OnTheList as a case study to illustrate the current sustainable fashion marketing and consumer behaviors on social media, because the existing literature has not provided enough case studies, especially in developing countries [51]. Since a limited number of studies have discussed sustainable fashion beyond the levels of micro-organizations and individual consumers [18], it is promising for future research to examine multiple organizations throughout the fashion industry and identify a pattern of posting texts and consumer reactions. Second, the study is restricted to the investigation of posting texts due to the disadvantages of text mining techniques. In addition to texts, the study finds that posting content also includes photos and videos, which cannot be analyzed by text mining. However, with the development of technology, future research may employ other high-tech methodologies to mining the effectiveness of different forms of posting content on consumer behaviors in sustainable fashion marketing.

Authors' contributions Zheng Shen-writing the manuscript. The author read and approved the final manuscript.

Availability of data and materials All posts analyzed during the current study are available on the OnTheList Facebook Page (https://www.facebook.com/onthelistofficial/).

Declarations

Conflict of interest The author declares no conflict of interest.

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