

# A Time-Series Approach to Changes in Second-Hand Consumption Perception

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**Abstract** This study examines changes in consumer perception regarding second-hand consumption in a time series manner. The research method applied text mining to newspaper and consumer perception over three periods (from 2017 to 2019, from 2020 to 2022, from 2023 to 2024 July). The results are as follows. The amount of environmental news was not large between 2017 and 2019, but the amount has increased exponentially since 2020. Because of this, consumers would have been able to watch a lot of environmental news. Additionally, perceptions of second-hand clothing have also changed. From 2017 to 2019, the perception of low prices gradually changed to fashionable goods after 2020, and the perception of second-hand consumption shifted to environment and sustainability. In addition, it was confirmed that interest in professional platforms is now emerging as an online business. This can provide implications for second-hand fashion that extends product lifespan as concerns about environmental sustainability increase in the future.

**Keywords** Agenda setting theory, Environmental news, Second-hand consumption, Value-belief-norm theory

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## Introduction

Sustainability concerns are increasing daily. Sustainability is a core competitive edge in all industries, making it a springboard for future growth. In the fashion field, which is the main source of clothing waste and environmental destruction, new efforts are being pursued under the motto of sustainability. Various sustainable fashion programs such as fashion donation, second-hand clothing, and fashion rental services are increasing (Lee et al., 2021). H&M, a Swedish fast fashion brand, has attempted a sustainable fashion business, including the recycling program “Loop” and the acquisition of the second-hand platform “Sellpy.” In addition, Burberry, a luxury brand criticized for incinerating its inventory, was also striving for sustainability by entering the luxury second-hand platform “The RealReal” in 2019. Among this various sustainable fashion industry, the second-hand clothing market was growing rapidly. It is

predicted that the second-hand clothing market will grow 1.5 times faster than the fast clothing market within the next 10 years (Pulsepointdaily, 2024). A few years ago, the resistance to second-hand clothing was severe across generations (Liang & Xu, 2018). However, interest in sustainability has gradually increased, not only in business operations but also in consumption. In other words, as consumers’ perceptions change, purchase intentions for second-hand clothing are increasing. Of course, buying second-hand clothing has the advantage of being able to own good products with a relatively small budget, and second-hand clothing in particular has the characteristics of uniqueness and nostalgia (Harwood, 2020). However, rather than following the current trend in a few years, it is becoming one of the pillars of consumption under the “Meaning Out” movement that

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sustainable values are reflected in individual tastes (Kim, 2024). In addition, news affects consumers' perception of specific problems. The audience of the media is influenced by how much the news media emphasizes on the subject of the importance of issues covered by the news at the same time as acquiring various information by news exposure (McCombs & Reynolds, 2002). That is, media reports on various issues influence citizens' opinions or cognitive changes and form public opinion (Price et al., 2005). The more sustainable news is reported, the higher the awareness of the need for sustainable consumption. Therefore, it is necessary to examine changes in news and consumer perception as news reports may have affected consumers' perception of sustainable consumption. In particular, an interest in the environment and sustainability has increased, the perception on second-hand consumption has also changed, so there is a need to examine it over time. Most of the previous studies were on second-hand consumption at a single point of in time or on changes in consumers' perception of second-hand consumption over time, but there was a lack of studies examining the influence of media (Kim & Woo, 2022; Machado et al., 2019; Turunen et al., 2019).

RQ1. Has sustainable news changed?

RQ2. Has consumer's perception of second-hand changed?

The main contributions of this review are two-fold. First, this will make it possible to determine the implications for the revitalization of second-hand business according to changes in sustainable news. It can help second-hand companies establish future strategic directions by exploring the increase of sustainable news, not the search for some consumers. Second, it is not a simple technique of big data analysis, but interdisciplinary research that connects theory-based models and analysis, which can help in future research.

## Theoretical Background

### Sustainability News and Agenda Forming

Agenda-setting by the media influences not only the audience's perception of the important of issues, but also

their exposure, memory and conversation. McCombs and Shaw's (1972) agenda setting theory states that issues highlighted by mass media influence public perception. When media repeatedly reports and emphasizes a particular issue, the public also perceives it as important as their own issue. In addition, the more the media reports on the issue, the more likely it is that the issue will be remembered by audience. When audience judge important issues, they first recall the issues that are most easily accessible and retrievable from their memory structures. Ultimately, the agenda that the media reports the most has a significant difference in the audience's agenda memory. In addition, research is currently being conducted on agenda building and intermedia agenda-setting to determine who sets the agenda (Stern et al., 2020). That is, according to the network model of influence, recipients are connected to each other in various relationships, and information that appears in society spreads rapidly in unpredictable directions (Wang et al., 2023). From this perspective, the agenda provided by the media is quickly and widely spread through the SNS of each individual user. This is because, with the emergence of SNS, the concept is no longer limited to traditional media, making it not unilateral. Various social media platforms have emerged as arenas for public discourse, where individuals can express and refute their opinions. Accordingly, Wanta and Ghanem (2007) found a correlation of generally greater .50 between the amount of media agenda report and audiences' perception of agenda importance. The more times an article is reported in news media and SNS, the more important it is considered to be. However, there are differences in the agenda formed according to the nature of the media. Hao (2022) examined the differences in agendas formed by SNS and traditional media. Regarding traditional media, users judged it to have trustworthiness and authenticity, and formed a more directive, broad, and general agenda based on high loyalty. In addition, research has been conducted on how news influences eco-friendly consumer behavior. Danner et al. (2022) found that online news media agendas have a significant impact on public opinion by influencing organic food readers. Jati and Rahayu (2020) found that environmental awareness and concern are strengthened by exposure to environmental information on SNS among

teenagers. Therefore, it is expected that news agendas for sustainable consumption will be formed through various media and spread to the public arenas.

### Theory of Environmental Behavior

The behavior of second-hand clothing consumption could be examined by Stern (2000)'s value-belief-norm (VBN) theory. The VBN theory posits that values influence personal norms through environmental beliefs, which influence environmental behavior. In the past, second-hand clothing was chosen by consumers for its economic and practical aspects (O'Donnell & Hughes, 2007), but now second-hand clothing consumers do not simply choose for economic reasons. As they were informed and have experienced various environmental problems, their beliefs and perceptions about the environment have been created or changed, and they choose the second-hand clothing consumption to create better environmental behaviors. This could be seen in previous studies on the environmental consumption of second-hand clothing. In a study comparing second-hand users and non-second-hand users by Hur (2020), social contribution and environmental value were found to be values among second-hand consumers. In addition, a study of circular fashion by Kim et al. (2021) found that social value and environmental value influence purchase intention. Many consumers choose second-hand clothing because they are aware of its long-term use in a world of limited resources and environmental and ecological issues (Laitala & Klepp, 2018). This could also be confirmed by research on second-hand clothing consumption as a pro-environmental norm. Borusiak et al. (2020) pointed out that personal norm has a static effect on the intention to visit a second-hand shop. In Kim and Seock (2019)'s study of purchasing behavior of second-hand clothing and clothing made by recycling, they identified that personal norm influences purchasing behavior. In addition, the behavioral change model (BCM) of Hungerford and Volk (1990) shows that when environmental knowledge increases through information on environmental issues, environmentally friendly attitudes, awareness, and responsible behavior are formed. Therefore, according to the VBN theory and BCM, consumers are exposed to information on sustainability, and as their beliefs and awareness change, they practice

environmentally friendly behaviors, including second-hand consumption.

### The Circular Economy and Second-Hand Clothing

The circular economy refers to reducing resource depletion and environmental pollution by using minimum resources and increasing the maximum use of products by reuse, sharing, repair, remanufacturing, and recycling (Geissdoerfer et al., 2017). Similar concepts are cooperative consumption, sharing economy, and sustainability. The fashion field had attracted attention as the main cause of environmental destruction in the past, such as waste of resources and trash caused by fast fashion. However, various attempts have been made in the fashion sector, including industrial and consumer aspects, to promote a circular economy. Among them, the growth of the second-hand clothing market reflects the circular economy from the consumer side. Consumers, especially Generation Z and the Millennials, had shown increased environmental concerns due to COVID-19 by trying to increase their purchases of second-hand (Granskog et al., 2020). Most previous studies on second-hand clothing concerned clothing that moved from developed countries to underdeveloped countries, such as Zambia (Hansen, 2000) and Senegal (Baden & Barber, 2005). However, current second-hand clothing has been newly carried out with the concept of "sustainable and unique" rather than "used out" in the past, resulting in most online transactions taking the forms of peer to peer (P2P) or consumer to consumer (C2C). Therefore, recent studies of second-hand clothing have been conducted from a different perspective. A qualitative study by Turunen et al., (2019) explored the consumption value of second-hand luxury items, in which empowerment, social status, and other factors appeared. Machado et al. (2019) investigated various consumer buying motivations in second-hand luxury consumption.

In addition, second-hand clothing, not luxury goods, has another motivation for consumption for uniqueness. They reflect not current but past trends, so consumers could perceive it as unique. In addition, under the recently emerging vintage trend (Harwood, 2020) consumers perceived and purchased second-hand clothing as vintage, not out-of-date or rustic. Padmavathy et al. (2019) identified

economic motivations as well as ideological motivations, such as the need to be unique, nostalgia, and trust as online second-hand shopping motivations. Keim and Wagner (2018) also stated nostalgia, need for uniqueness, and need for status in a driver exploration study of the luxury fashion vintage. Furthermore, research has explored second-hand clothing as a new business area. Gopalakrishnan and Matthews (2018) proposed a strategy to analyze the business model of second-hand clothing. In addition, Appelgren (2019) looked at the changes in the second-hand market and suggested the direction of moving toward a circular economy for retailers. Thus, second-hand clothing is no longer just the “used out” of the past, but involves sustainability, symbolism, and business. Therefore, it is time to explore the effects of the changes in perspectives on second-hand clothing.

## Methodology

### Sustainability News and Agenda Forming

In this study, three periods were set: Period 1 (January 2017 to December 2019), Period 2 (COVID-19, January 2020 to December 2022), and Period 3 (January 2023 to July 31, 2024), and two types of data were collected: news related to the environmental sustainability issues and second-hand consumption. Although sustainability includes social and human rights issues, the context of environmental consumption was judged to be more appropriate for the purpose of examining the relationship with second-hand consumption, thus collection was limited. Textom's text mining was used to collect news articles and blog posts from Naver ([www.naver.com](http://www.naver.com)) and Daum ([www.daum.net](http://www.daum.net)). News media used data collection operators to limit keywords to include ‘eco-friendly’ and ‘sustainability’ and exclude ‘used cars’ through the Naver News Library. Next, a refining process was carried out, in which the collected original articles were reviewed, and automobile, technology, or policy-related content was deleted. Additionally, among sustainability articles, content related to society or human rights, rather than the environment, was deleted. In blog posts about consumer second-hand, the content related to ‘second-hand’ was set as a search keyword, while data

collection operations were limited to exclude ‘home appliances’ and ‘children’. Next, promotion and recruitment were deleted by looking at the original data. All data preprocessing steps involved extracting nouns as the part of speech for morphological analysis, using the MeCab analyzer. In order to change words in preprocessing, researchers refined the data by directly inputting additional words with the same meaning or spacing based on the AI automatic refinement words. It was determined that the search results for ‘eco-friendliness’ and ‘sustainability’ would appear in news articles at a higher frequency, so related words were excluded, and searches for ‘clothing’, ‘used’ and ‘fashion’ were also excluded from consumer data. Afterwards, we extracted key noun keywords from the collected texts and conducted content analysis by examining specific news scripts in addition to frequency, TD-IDF, and LDA topic modeling. Keyword rankings were selected by synthesizing the result values of the top 50 TD-IDF rather than frequency. As a result of modeling by setting multiple topic numbers, high consistency and interpretability were shown in five topics. In addition, the number of topic words was set to 50 to include many words per topic and analyzed. The final collected news data was 630 for the first period, 1970 for the second period, and 965 for the third period. Second-hand consumer posts were collected in 242, 547, and 568 periods, respectively. The changes by news articles is <Table 1>, and the topic of news is <Table 2>. The change by consumer perception is <Table 3>, and the topic of consumer perception is <Table 4>.

## Results

### Changes in News Keyword Related to Environmental Sustainability

To find out the extent of consumers’ exposure to environmentally friendly news, we compared and analyzed the top 50 keywords (TD-IDF), frequency, and topics that appeared in news big data according to Period 1 (2017-2019), Period 2 (2020-2022), and Period 3 (July 2023-2024) <Table 1, Table 2, Figure 1>. Period 1 and Period 2 were the same three-year period, but it was confirmed that period 2

Table 1. Changes in keywords about the environment in Korean news media

No.	2017-2019			2020-2022			2023-2024		
	Term	TD-IDF	Frequency	Term	TD-IDF	Frequency	Term	TD-IDF	Frequency
1	Material	338	400	Material	1668	1420	<b>Fiber</b>	561	347
2	Environment	331	341	Utilize	1581	1404	Material	512	450
3	Product	324	299	Brand	1556	1314	Brand	504	376
4	Brand	317	302	Product	1551	1402	Utilize	474	401
5	Utilize	312	259	Environment	1521	1351	Product	472	442
6	Fiber	303	173	Fiber	1502	781	Environment	434	383
7	Company	280	191	Business	1446	870	<b>Company</b>	422	239
8	Production	222	126	<b>PETbottle</b>	1282	681	<b>Business</b>	382	208
9	Ethic	220	107	Production	1153	629	<b>Industry</b>	355	184
10	Consumer	212	115	Society	1100	585	Production	350	201
11	<b>NOW</b>	195	72	Consume	1092	549	<b>Circulation</b>	342	172
12	Outdoor	193	91	Plastic	1045	481	Development	331	169
13	Plastic	191	79	Value	1033	539	Consume	315	153
14	Value	189	97	Development	995	482	Society	312	149
15	Development	186	90	Goods	968	457	Plastic	308	139
16	Society	180	78	<b>Certification</b>	958	376	Value	306	162
17	Recycling	175	67	Industry	908	387	Market	396	133
18	Design	175	74	Release	904	423	<b>Carbon</b>	294	127
19	Global	173	78	<b>Hyosung</b>	886	291	<b>Kolon</b>	292	97
20	Trend	170	75	Resource	854	353	Resource	286	135
21	Eco	169	71	Upcycling	849	348	Global	283	140
22	<b>Patagonia</b>	168	60	Outdoor	845	320	Activity	276	125
23	Campaign	160	59	Global	826	362	Upcycling	266	113
24	Fair	159	65	<b>Circulation</b>	824	330	Textile	262	115
25	Release	157	65	<b>Campaign</b>	802	313	<b>Certification</b>	261	103
26	Technology	157	63	Market	777	305	Practice	258	120
27	Textile	153	60	Textile	768	307	Goods	249	95
28	Blackyark	147	53	Collection	767	296	Earth	248	108
29	Business	145	57	Action	761	340	Sport	245	86
30	<b>Hyosung</b>	144	41	Retailing	756	309	Campaign	245	96
31	Function	144	58	Trend	709	273	Outdoor	237	88
32	Upcycling	142	54	Recycling	694	261	Technology	236	94
33	Nature	141	53	<b>Carbon</b>	685	257	Future	232	99
34	Preservation	140	56	Future	681	268	Cycling	228	100
35	Pollution	135	56	Extension	673	265	Waste	227	93
36	Sport	135	48	Design	662	247	Extension	226	90
37	Process	134	51	Earth	639	236	Domestic	221	88
38	Earth	127	43	Energy	628	202	Economy	218	81
39	<b>PET bottle</b>	123	44	Sale	625	232	<b>PETbottle</b>	215	78
40	Waste	123	43	Apply	618	224	Hyosung	208	63
41	<b>Certification</b>	122	41	<b>Blackyark</b>	617	182	Apply	199	75
42	Interest	121	47	Growth	615	226	Project	193	67
43	<b>Fast fashion</b>	121	43	Uniform	603	167	Effort	190	73
44	Manufacturing	120	44	Style	592	206	Retail	189	69
45	Yarn	115	39	Technology	588	205	Support	187	64
46	Action	114	41	Effort	586	215	Problem	184	69
47	Leather	114	36	Eco	576	195	Sale	181	66
48	Adidas	110	35	Establish	572	199	Design	178	62
49	Future	110	39	<b>Project</b>	569	193	Trend	175	62
50	Trash	107	36	<b>Northface</b>	569	171	<b>Jeju</b>	173	50

Table 2. Changes in topic about the environment in Korean news media

Topic		2017-2019		2020-2022		2023-2024
1	Industry	brand, Blackyark, NOW, outdoor, industry, design, fabric	Environment	environment, value, society, upcycling, carbon, growth	Environment	environment, circulation, recycling, carbon, resource, society
2	Technology	Hyosung, global, technology, plastic, utilize, certification, sport	Innovation	production, Hyosung, innovation, sport, brand, utilize	Company	material, company, brand, global, Kolon, domestic, product
3	Ethic	ethic, fair, production, value, campaign, Patagonia	Business	business, circulation, Blackyark, Samsung, Lotte	Manufacturing	activity, project, bio, chemistry, apply, process, manufacturing
4	Environment	environment, eco, action, process, social, consumer	Product	material, release, product, trend, item, zero	Action	value, consumption, upcycling, plastic, action, campaign
5	Recycling	recycling, pollution, upcycling, fast fashion, material, product, development, waste	Campaign	PETbottle, uniform, donation, effort, campaign	Utilize	PETbottle, sports, sale, problem, earth, certification, utilize



Figure 1. Word cloud of news at 2017-2019/2020-2022/2023-2024

overwhelmingly increased the number of related news more than three times compared to period 1. Period 3 and Period 2 can be estimated to be similar if viewed in months. In other words, a lot of news related to eco-friendly sustainability has been reported continuously since COVID-19. In addition, in all three periods, ‘material or fiber’ and ‘brand’ appeared as the top words, and appeared in the main top rankings for eco-friendly brands and news related to developed materials. In Period 1, articles of eco-friendly materials appeared mainly, but gradually in Period 3, various aspects of eco-friendly companies appeared. News articles about sustainability continued to appear. However, we could confirm that its importance was gradually strengthening as time passed. In particular, the focus was initially on production-related sustainability, the issue has been gradually changed to society and value, and after COVID-19, we are able to observe a trend of expansion toward a global perspective.

In Period 1 (2017-2019), key words such as ‘Patagonia’,

‘Now’, ‘Hyosung’, ‘Certification’, and ‘Pet bottle’ appeared. In addition, when looking at the contents of the topic analysis, major topics appeared in the order of industry, technology, ethics, environment, and recycling. The main content was the use of industries, brands, and technologies that utilize eco-friendly materials, and the interest in ethics and fairness also appeared as noteworthy articles. Although it is not a major topic, it is understood that interest in the environment is being highlighted through the awareness of fast fashion, and interest in upcycling using PET bottles and various certifications related to it have been featured in articles.

“Hyosung TNC is not only in the yarn market but also in the functional clothing industry, especially in the fashion industry, and is producing recycled polyester yarn using PET bottles, which reflects the recent trend of eco-friendliness and

sustainability. ...”(Yoo, 2019)

“... In addition, fast fashion brands have recently launched a fair fashion collection using recycled materials to promote sustainability-related products such as eco-friendly organic ethical production in Europe ...”(Han, 2018)

In Period 2 (2020-2022), the TD-IDF of specific material-related keywords such as ‘PET bottle’, ‘plastic’, and ‘carbon’ as well as the keywords ‘certification’ and ‘circulation’ increased by 4-5 times compared to Period 1. News about corporate activities that inform consumers about eco-friendly products, such as ‘Campaigns’ and ‘Projects’, along with new brands that had not previously appeared, such as ‘North Face’, stood out. Specific information about eco-friendliness appeared in the direction of news than in Period 1, and the environment appeared as the biggest topic in topic analysis. The campaign was the fourth, but it appeared as a new topic. In other words, it can be seen from the article that the development of innovative technologies for eco-friendliness is diversifying, and the efforts of companies are increasing.

“The team will compete in eco-friendly uniforms, including a sustainably designed U.S. team awards ceremony uniform and footwear and lifestyle apparel made primarily from recycled waste materials, with the goal of a carbon-free future. Nike also released a collection called Space Hippie, which utilizes waste materials from the production process...”(Kim, 2020)

“As eco-friendliness and ethical behavior are becoming the main topics in sustainable fashion management, strategies are being strengthened from material changes to marketing campaigns. The North Face also wants to join in and take the lead, and announced that it will continue to expand the use of recycled materials this year...”(Oh, 2020)

In Period 3 (2023-2024), ‘carbon’, ‘fiber’, and ‘circulation’, which were previously ranked low, are ranked high, and it is found that there were many eco-friendly articles from a business perspective such as ‘industry’,

‘company’, and ‘management’. While ‘Hyosung’ appears as a major domestic eco-friendly company in periods 1 and 2, ‘Kolon’ appears frequently in eco-friendly news in period 3. Jeju’ is also a newly appeared word, and we could confirm that there is an increase in eco-friendly news through collaboration between the public and private sectors. In the topic analysis, the environment emerged as the most important topic, just like in Period 2, and ‘company’, ‘manufacturing’, ‘activity’, and ‘utilization’ emerged as the main topics in terms of business aspects, even more so than in Period 2.

“This is to secure green consumers through virtuous cycle activities and contribute to improving the image of an eco-friendly company that reduces clothing waste. A Kolon FnC official explained that they are aiming for a virtuous cycle structure that recycles resources and will practice ESG by strengthening sustainable fashion...”(Ko, 2023)

“For public-private cooperation, which will be the starting point for a circular economy society, it will sign a business agreement with outdoor clothing company BYN Black Yak to establish a sustainable high-quality resource circulation system. Through this agreement, the public sector will secure and provide high-quality transparent PET bottles, and private companies will produce and sell eco-friendly products using Jeju transparent PET bottles...”(Kang, 2023)

## Changes in Consumer Perception of Second-Hand

To understand the changes in consumer awareness of second-hand, the top 50 keywords (TD-IDF) that appeared in consumer big data for Period 1 (2017-2019), Period 2 (2020-2022), and Period 3 (2023-2024.7) were analyzed (Table 3, Table 4, Figure 2). In all three periods, consumers have a common perception of second-hand as having a ‘vintage’, regardless of the era. Period 1 was mainly about traditional offline markets such as Dongmyo and grunge looks, while as Periods 2 and 3, environmental content appeared more specifically. This shows that consumer

Table 3. Changes in consumer perception of second-hand consumption

No.	2017-2019			2020-2022			2023-2024		
	Term	TD-IDF	Frequency	Term	TD-IDF	Frequency	Term	TD-IDF	Frequency
1	Market	147	110	Vintage	281	147	Vintage	377	263
2	Old-fashioned	136	62	Transaction	274	179	Market	309	202
3	Sale	123	118	Sale	273	193	Old-fashioned	296	135
4	Product	119	87	<b>Luxury</b>	266	117	Utilize	270	168
5	Vintage	118	58	Utilize	266	141	<b>Environment</b>	260	201
6	<b>Luxury</b>	95	42	Market	230	263	Transaction	257	168
7	Shop	94	55	Purchase	228	143	Brand	255	155
8	Utilize	92	45	Consume	221	133	<b>Sustain</b>	253	152
9	Price	86	47	<b>Environment</b>	220	148	Shop	244	111
10	Antique	84	38	<b>Platform</b>	213	105	Sale	240	149
11	<b>Grunge Look</b>	84	26	Product	213	120	Product	238	147
12	Brand	84	43	Brand	212	111	Market	232	202
13	Market	79	29	USA	197	121	Purchase	224	167
14	Transaction	79	31	Usage	188	99	Platform	214	124
15	Goods	77	29	<b>Department</b>	186	68	Consume	208	105
16	Second-hand	76	304	Generation	184	81	<b>Pickup</b>	182	80
17	<b>Africa</b>	72	25	Shop	178	85	<b>Organize</b>	178	58
18	<b>Pongmool</b>	71	28	Global	176	91	Style	173	73
19	Real	71	15	Old-fashioned	174	60	eco-friendly	170	74
20	Purchase	70	31	<b>Resell</b>	159	48	World	166	77
21	<b>USA</b>	66	28	Earth	156	74	Service	165	64
22	Money	65	25	<b>Waste</b>	15266	66	Closet	162	66
23	MarketinU	64	21	<b>Thredup</b>	152	62	Fast fashion	155	67
24	Business	61	16	Company	148	64	Price	155	70
25	Environment	61	24	Growth	148	63	Industry	154	68
26	Look around	59	26	Sustain	148	66	<b>Dirty</b>	152	65
27	Shoe	58	24	<b>Fast fashion</b>	146	62	Growth	145	56
28	Style	58	22	<b>Trash</b>	142	57	Trash	145	57
29	Life	57	20	Eco-friend	141	61	Production	144	65
30	Tour	57	23	Trend	140	58	USA	141	61
31	Variety	55	23	Look	135	38	Trend	140	56
32	Recommend	54	20	Patagonia	134	41	Material	135	49
33	<b>Dongmyo</b>	53	17	Volume	134	54	Company	135	53
34	<b>Date</b>	53	19	Price	131	55	<b>Charan</b>	132	37
35	<b>Japan</b>	53	18	Online	129	53	<b>Luxury</b>	131	47
36	Need	50	18	Closet	128	46	Export	127	42
37	Design	49	18	Industry	127	47	Online	127	52
38	Generation	48	15	Pickup	126	46	Donation	126	48
39	Flea market	47	14	<b>Plastic</b>	124	44	Earth	123	47
40	Sundries	46	16	<b>Chile</b>	124	35	Resell	123	38
41	Fiber	45	14	Production	121	49	Business	123	39
42	Textile	45	14	Value	120	45	Review	121	42
43	Photo	45	17	<b>Donation</b>	118	40	<b>Wash</b>	114	39
44	Consume	44	16	Second-hand	118	901	Item	113	37
45	Sustain	44	15	<b>Carbon</b>	117	38	Resource	113	43
46	<b>Fast fashion</b>	43	16	Style	116	42	<b>Preservation</b>	110	40
47	Growth	43	15	Service	116	41	Value	106	39
48	Time	42	16	Site	114	38	Fiber	106	35
49	Condition	42	14	Retail	114	43	<b>Circulation</b>	106	35
50	Bag	42	15	UK	112	38	<b>Interest</b>	102	36



Table 4. Changes in topic about consumer perception of second-hand consumption

Topic		2017-2019		2020-2022		2023-2024
1	Utilize	vintage, price, brand, purchase, utilize, real, knit, size,	Luxury	luxury, transaction, company, consumer, department, brand	Environment	environment, trend, circulation, resource, interest, eco-friendly
2	Luxury	sales, luxury, shop, antique, generation, volume, style	Style	Japan, resell, style, procuracy, retail, look, vintage	Online	market, platform, pickup, online, earth
3	Old-fashioned market	recommend, date, Dongmyo, goods, market, old-fashioned	Online	UK, USA, closet, online, trend, industry, Thredup, platform, product, sale	Growth	old-fashioned, utilize, sale, organize, waste, growth, industry
4	GrungyLook	consumer, need, dirty, Grungy Look	Environment	material, plastic, shop, Sungsu, waste, utilize, usage, fast fashion, environment	Brand	vintage, brand, price, Closetshare, design, choice, company
5	Environment	trash, site, Japan, MarketInU, growth, transaction, environment	Old-fashioned	old-fashioned, production, dirty, company, world, consume	MarketInU	washing, trash, MarketInU, look, purchase, closet



Figure 2. Word cloud of consumer perception at 2017-2019/2020-2022/2023-2024

awareness and interest in the eco-friendly sustainability of second-hand is increasing over time. It was confirmed that consumer perception of second-hand is gradually changing to sustainability. In the beginning, second-hand were perceived as economical and unique, but as time went by, the concept of the environment gradually increased, and it was confirmed that the concept was expanding significantly after COVID-19.

In Period 1 (2017-2019), there were many mentions of offline second-hand markets such as ‘Pungmul’, ‘Dongmyo’, ‘Date’, ‘Grunge Look’, and ‘Antiques’, and it was found that these were enjoyed as dates. For imported second-hand, ‘USA’ and ‘Japan’ appeared, and for exported second-hand, ‘Africa’ appeared. As a result of topic analysis for period 1, the main topics were utilization, luxury goods, second-hand market, grunge look, and environment in that order. The main topics were about utilizing second-hand and purchasing luxury goods at low prices, but topics related to the environment also began to appear gradually.

“In terms of cost-effectiveness, it’s second-hand clothing, so you can buy it at a price that’s completely deflated. I don’t personally prefer luxury brands, but there are a few that are guaranteed as much as high-end prices. Some clothes have a quality design or a unique style. Some clothes have a design that is so new that it is hard to believe that they are used. Some clothes look like new products with no signs of use. ...”

“While I was thinking about it, I suddenly had the thought that they might be selling sustainable clothing second-hand. So, I looked into where I could get second-hand and headed to the Dongmyo Flea Market, which is famous for its flea market. ...”

“I originally had no prejudice against second-hand clothes, and I enjoyed making a good bargain at Dongmyo or Gwangjang-dong flea markets. I

used to buy second-hand clothes because I thought I would buy clothes that were made of good materials, had personality, or were simple at a low price. Now, I add a small but grand reason to those personal reasons. I have been doing very little clothing shopping for almost a year since I started zero waste, ...”

In Period 2 (2020-2022), keywords related to ‘luxury goods’ still appeared at the top, but the ranking for ‘environment’ was higher than before, and ‘Threadup’, an online second-hand ‘platform’, appeared due to COVID-19. ‘Fast fashion’, ‘waste’, ‘carbon’, ‘trash’, and ‘Chile’ appeared, and the harmful effects of fast fashion and alertness emerged as the main keywords. In addition, it can be seen that second-hand recognized as different from Period 1 as new keywords such as ‘Resell’ and ‘Department Store’. Looking at the topic analysis, although it is still a major topic for luxury second-hand, the environment has been identified as a major topic compared to the previous period, and new online transactions and style have been identified as new topics.

“The Rising Second-hand Fashion If possible, it is a good idea to use second-hand clothes instead of buying new ones. The advantage of second-hand trading is that you can buy the clothes you want at a low price while protecting the environment. According to the 2019 Resale Report by ThredUp, a second-hand clothing company in the U.S., one in three Generation Z people buy second-hand clothes ...”

“This is second-hand waste dumped in the desert of Chile. About 59,000 tons of second-hand arrives every year through the port of Iquique in northern Chile. Some of these are useful and are sold to clothing merchants, but about 39,000 tons are simply dumped in the Atacama Desert. Don’t you buy clothes that are trendy and throw away clothes that are out of style? Just by wearing clothes for a long time, you are helping the environment ....”

“These days, the meaning has changed and

limited edition products with high scarcity are mainly traded, and the consumer behavior is changing to buying and selling at a higher price than the regular price... The global sneaker resale market size is expected to reach 6 billion dollars by 2025 ...”

In Period 3 (2023-2024), the keywords ‘environment’ and ‘sustainable’ appeared in top order than in the previous period, and the words ‘eco-friendly’ and ‘circulation’ emerged, and it can be seen that the ranking of ‘luxury’ has fallen a lot. A second-hand fashion app called Charan has appeared, and the words “dirty,” “washing,” “collection,” and “organization” show that consumers are increasingly interested in and participating in second-hand. The topic analysis results showed that environmental concerns emerged as the most important topic compared to the previous period, followed by the growth of online and second-hand transactions and offline ‘marketIU’.

“Thrift stores that specialize in selling second-hand items... That means the money we might have spent on new clothes could be used to support other areas of the economy, such as local businesses or investments. Plus, buying second-hand clothes is a more sustainable and eco-friendly choice, as it reduces the demand for new clothing production and helps reduce waste. ...”

“I recently found out about Charan, a second-hand platform, and used it. Usually, when I have too many items or clothes, I throw them away to organize them, but I think throwing them away isn’t the only solution. Since they classify them as environmentally harmful and unsellable, I think I can buy them with confidence. ...”

“MarketIU products are directly imported from overseas as second-hand and are laundered, so they are trustworthy and their goal is to create a sustainable used culture by discovering second-hand values, which is perfect for today’s society where environmental issues are on the rise. I love it.”

## Discussion

### Summary of Findings

With the recent emergence of eco-friendly trends and ESG era, sustainable second-hand consumption is increasing. Although research has been conducted on fashion second-hand, it still remains a research topic to be explored. In this study, we attempted to examine changes in consumer's perception from a dynamic perspective by analyzing big data on eco-friendly news articles and consumer perception of second-hand. In order to achieve sustainable consumption, consumer's agenda must first be accumulated, and their value and beliefs must be transformed in a sustainability. As a result of the analysis, consumers also were exposed to news on sustainability from 2017 to 2019, confirming that it has diversified and became specific more since 2020. That is, knowledge about sustainability was formed to some extent through news from 2017 to 2019, but as time passed, the amount of news increased, which likely influenced the formation of attitudes and awareness about it. In addition, as a result of investigating consumers' perception of second-hand, it was perceived as low-priced such as Dongmyo in 2017~2019, but a new approach to second-hand through resale emerged after 2020. Consumers who previously engaged with second-hand only offline are now expanding their access as online platforms have grown since 2020. This study indirectly confirmed that continuous exposure to environmental news has influenced a shift in consumers' actual perceptions.

### Implications

The theoretical implications are as follows. First, the overall mechanism from the cause of cognitive formation to consumption for second-hand could be examined through theory-based big data analysis. This can be said to be a new attempt that was not carried out in previous research. In most of previous research were on technical methods for recycling or consumer perception of second-hand or recycled products (Appelgren, 2019; Liang & Xu, 2018; Machado et al., 2019; Turunen et al., 2019). In addition, the power of the media in second-hand clothing could not be examined. However,

practically second-hand clothing is difficult to recycle and is being reused. In a situation where second-hand consumption is increasing, there has been insufficient research on the importance of the media in sustainable second-hand consumption. In this because the media plays an important role in forming consumer perception and at the same time forming a strategy for related businesses. Although prior research on second-hand consumption did not examine the power and change of the media, in this study, this study has implications by examining changes in media and consumer perception together. Second, an approach was attempted using a new methodology that is not often used in second-hand research. Previous studies on second-hand consumption have mostly been quantitative, making it difficult to identify changes in consumer perception. The method of finding statistically significant relationships through a survey based on theory could confirm a clear causal relationship for a specific topic, but it was difficult to expect free and variegated outputs. However, the results of analyzing dynamic big data clearly showed an increase in awareness of second-hand consumption by examining the changing patterns of a large number of consumer groups. In other words, the greatest advantage of big data analysis is that the research results can reflect the real world well because certain patterns are discovered in a large amount of real-world data and conclusions are drawn based on them.

The practical implications are as follows. First, it can help second-hand companies establish future strategic directions by exploring the increase in perception of second-hand consumption, not the search for some consumers. In previous studies, although fashion was an industry that caused environmental problems, there had been little discussion of the stage of disposal of fashion from a global (macro) point of view. However, there was a need to closely examine the perception and flow of second-hand goods in the international reality that second-hand discarded in the country are reused in other countries (Baden & Barber, 2005; Hansen, 2000). In addition, along with the increase in sustainable consumption perception due to COVID-19, the rapid growth of second-hand trading platforms such as ThredUp is remarkable. Therefore, through this study, it was confirmed that there is a high possibility of continuous

increase in the future, second-hand companies can help to establish more concrete directions for consumer policies and marketing strategies. In other words, it is possible to seek expansion or diversification of second-hand business according to an increase in sustainable consumption. Furthermore, since sustainable consumption perception has increased due to the power of media, related companies will be able to focus on the direction of media in the future and help establish the size and direction of the business. Second, the strong points of the practical use of big data were identified. This is because, in other research fields, if big data is used as in this study to use a convergence methodology mixed with consumer perception, a strategy that further understands consumer needs can be derived. In this study, we analyzed it specifically through time series comparison and topic analysis. In addition, the direction of media and changes in consumer perception were identified, and a guide that can be used practically in similar fields was presented.

### Limitations

The limitations of this study are as follows. It cannot be said that the perceptions identified of second-hand clothing by analyzing Korean news articles and consumers marked a global trend. Therefore, examining news articles and consumer perception in a variety of countries could lead to greater generalizability. In addition, there was a limitation in that it was not possible to determine causal relationships between Korean data. There is a need to further investigate whether the news led to consumers' second-hand consumption behavior and what impact it had on consumers' sustainable consumption. If an advanced analysis program that analyzes causal relationships like LIWC for English words appears in Korean in the future, the causal relationships of the big data raised in this study will be identified and valid results will be derived.

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