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Weather-Related Complaints from Fashion Retailers

Environmental Scan from Korean Newspapers from 2000 to 2020

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Abstract In the seasonal fashion retail market, unexpected weather is cited as a significant factor in sluggish sales. The average temperatures of four seasons in Korea have risen as much as 1.3°C compared to 50 years ago. In addition, the season onset dates and duration of the seasons have shifted, with summer getting about 21 days longer and winter about eight days shorter. Through text frequency analysis of headlines of newspapers published from 2000 to 2020, this study aims to comprehend and outline weather-related complaints discussed in the fashion industry. The weather-related complaints include Changma, cold wave, delayed season, early season, heat wave, hot summer, seasonless, transition season, unseasonable weather, warm winter, wind, and wintry spring. According to weather effects on the fashion retail market, those complaints are classified into seasons-related, temperature-related, and non-temperature-related complaints. The impact of each classification on the industry was illustrated with historical events in the newspapers. In conclusion, this study proposes suggestions for the fashion industry to adapt and prepare for unexpected weather changes.

Keywords Climate change-induced weather change, Fashion supply chain, Sales, Overstock, Weather-related complaint

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Introduction

The fashion retailers mentioned bad weather as a cause of poor sales. Many researchers studied the effect of weather on clothing sales (Agnew & Palutikof, 1999; Arunraj & Ahrens, 2016; Bahng & Kincade, 2012; Bertrand, Brusset, & Fortin, 2015; Chu, Kim, & Choi, 2013; Han, 2021; Hong & Lee, 2013; Kim, Hwangbo, & Chae, 2017; Lim & Lho, 2018; Martinez-de-Albeniz & BelKaid, 2021; Oh, Ha, & Jo, 2022a; Oh, Jo, & Ha, 2021; Oh, Oh, & Choi, 2017; Roth Tran, 2019), and industry professionals addressed the importance of weather in the retail market (Arnett, 2019; Barbaro, 2017; Oh, 2015; Starr-McCluer, 2000). Fashion retail is one of the most weather-sensitive industries (Agnew & Palutikof, 1999), and unexpected weather changes lead to economic consequences (Changnon, 1999, 2005; Oh & Jo, 2011).

In the 2000s, as weather changes became more severe and frequent, the extreme temperatures in Korea were frequent and showed a long-term warming trend, including low-frequency cold waves (An et al., 2011; Korea Meteorological Administration [KMA] 2020; Lee, 2017; Min et al., 2015). According to the short-term climate outlook (2022-2050) on temperature, precipitation, and anomalies on the Korean Peninsula, the average temperature is expected to rise from 1.33°C to 1.93°C (KMA, 2020). The shift is expected to accelerate in Korea as the season starts and the duration changes. These weather events caused by climate change will have a more significant impact on the Korean fashion industry.

Previous studies explored the relationship between sales and weather factors such as temperature, precipitation, wind, and humidity. Still, results were diverse due to the product

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type, season, store type, and location (Oh, Ha, & Jo, 2022b). Therefore, using weather factors in decision-making is challenging due to the inconsistent results of previous studies. The primary purpose of this study is to understand the weather events that the fashion and retail industries are facing in the unexpected weather change in Korea due to climate change. This study extracted weather events called complaints affecting the fashion industry through environmental scanning using newspapers. As a grounded theory approach, this study presents a classification system for weather events related to the effects on the fashion and retail sectors, identifies the impact of weather changes on the fashion industry through specific examples of newspapers, and proposes strategies to cope with problems caused by unexpected weather changes. Weather events caused by climate change will have a more significant impact on the Korean fashion industry. Since many fashion and retail companies in Korea are small and medium-sized enterprises, identifying the company's external factors, such as weather, is challenging. Therefore, this study is expected to provide helpful information to the Korean fashion industry.

Backgrounds

Climate Change-Induced Weather Change in Korea

The recent global warming trend directly affects the temperature and precipitation variability in Korea (KMA, 2020). The annual temperature increase trend in Korea before 2000 is mainly due to strong seasonal warming in winter. Since 2000, there has been a stronger warming trend in summer, and the cooling trend has weakened in winter. The increase in the probability of warm extremes in average monthly temperatures over the past decade is particularly noticeable in May. According to Lee's study (2017), extreme hot and cold temperatures are expected to rise in the future in summer, while only extremely warm temperatures are expected to rise significantly in winter. Average summer precipitation increased by 15% compared to the previous decades, and it is due to the increase in rainfall in August. However, the average precipitation during the rainy season decreased by about 5% (An et al., 2011).

Moreover, in the second half of the 20th century, Korea changed the onset date and duration of the seasons. Recently, global warming is also evident on the Korean Peninsula, so the winter period has been shortened; the summer period has been extended. The onset date of winter is, on average, four days late; the onset date of spring is advanced by six days (Choi & Kwon, 2001; Choi, Kwon, & Robinson, 2006). Furthermore, in the 2040s and 2090s, when the present carbon dioxide emission-related model (SRES A1B) scenario was used, the onset dates of spring and summer were earlier, and the start dates of fall and winter were delayed. This trend is predicted to be more profound in the 2090s than in the 2040s (Kwon, Kwon, & Boo, 2007). As a result of predicting climate change in the Korean Peninsula in the future is expected to be included in the humid subtropical climate zone in most urban areas (KMA, 2020).

Weather data from 1971 to 2020 was downloaded from the KMA to find the change in the average temperature of seasons and four seasons' onset dates and duration (KMA, n.d.). The average temperatures of the four seasons from 1971 to 2020 are illustrated in Figure 1. Compared to the average summer temperature of 1971~1980, the average summer temperature in 2011~2020 increased by 1.3°C. Compared to 1971-1980, the winter temperature in 2011~2020 increased by 0.8°C. In addition, compared to the average temperature in spring 1971~1980, spring 2011~2020 was 1.4°C, and fall 2011~2020 was 1°C higher than fall 1971~1980. Figure 2 shows four seasons' onset dates and duration from 19171 to 2020. The duration of summer in 2011~2020 was 21 days longer than 1971~1980, but winter in 2011~2020 was 17 days shorter than 1971~1980. In the case of spring, three days were longer, and in the case of fall, seven days were shorter. The onset date of summer in 2011~2020 was 14 days earlier than 1971~1980, and the onset date of spring in 2011~2020 was 17 days earlier than 1971~1980. However, the onset date of winter in 2011~2020 was one day later than 1971~1980, and the onset date of fall in 2011~2020 was eight days later than 1971~1980.

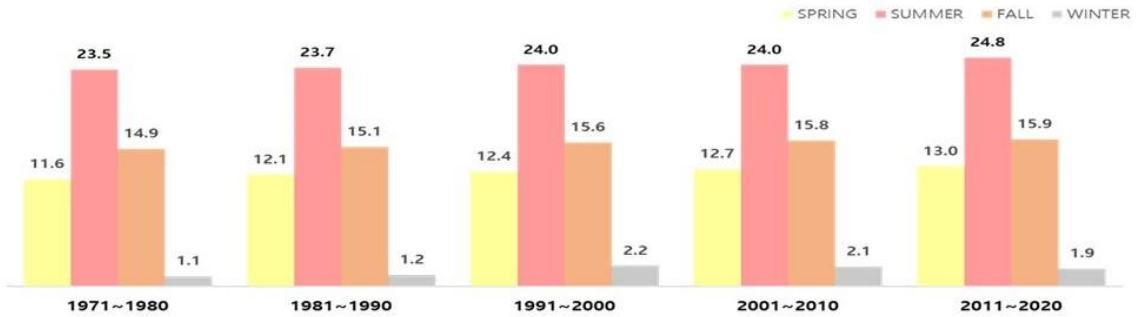

Figure 1. The average temperature (°C) of four seasons from 1971 to 2020

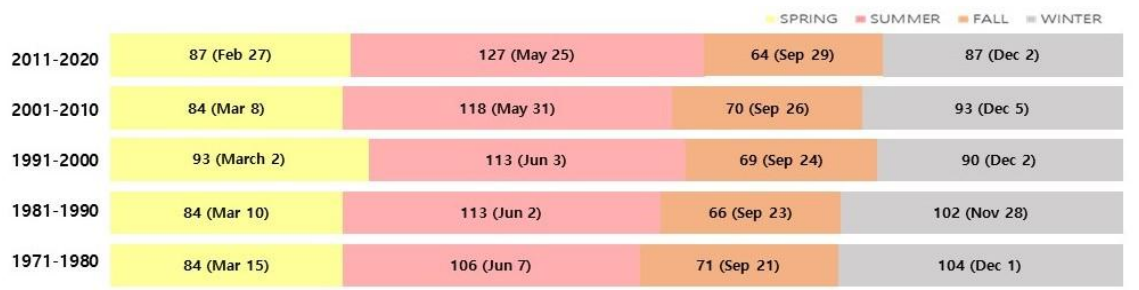

Figure 2. The average onset dates and duration of four seasons from 1971 to 2020

Effects of Weather on the Fashion Industry

Certain weather conditions can make it difficult for the fashion industry to respond to short-term opportunities or risks, as decisions on demand forecasting, supply chain management, labor scheduling, marketing, and promotions are made weeks or months in advance. Forecasting demand for seasonal clothing, in particular, is a challenge as the fashion retail sectors run their businesses around dates or retail events and develop merchandising plans based on previous sales history. In the winter of 1997/1998 and 2015/2016, the northern hemisphere of the world experienced a warm winter due to the El Niño event, which caused many retailers to experience losses (Changnon, 1999; Oh & Jo, 2011, Pasquarelli, 2015; Zaczkiewicz, 2016). In November 2015, the average temperature in Korea was 10.1°C, 2.5°C higher than the climate normal temperature (7.6°C). As a result, winter clothing sales fell 18.1% year-over-year (Lee, 2015). Temperature leading seasonal clothing sales up to a certain period of a season (Agnew & Palutikof, 1999; Arunraj & Ahrens, 2016; Bahng & Kincade, 2012; Bertrand, Brusset, & Fortin, 2015; Martinez-de-Albeniz & BelKaid, 2021; Oh, Jo, & Ha, 2021; 2022a). Snow depth (Arunraj & Ahrens, 2016) and rain (Kim, Hwangbo, & Chae, 2017; Lee, Kwak, & Hwang, 2014; Martinez-de-Albeniz & BelKaid, 2021) were considered significant factors in shopping clothes. Consumers are physically and psychologically inconvenienced by going to a clothing store to buy clothes during harsh weather, such as snow or rain, resulting in decreased sales.

The fashion industry is a highly fragmented global value chain encompassing textiles producers, designers, manufacturers, and retailers. As a truly global business, with six to nine months at the shortest and 24 months or more before it is delivered from raw material production to consumers (Doeringer & Crean, 2006). Indeed, Korea's clothing manufacturer has a high proportion of overseas production (Korea Federation of Textile Industries [KOFOTI], 2020), and 97% of small manufacturers employ less than 20 people (KOFOTI, 2021). Thus, clothing product procurement requires long lead times and lesser flexibility,

causing overstocking and understocking problems. To make matters worse, extended payment periods are taken for granted in the Korean fashion industry (Kwon, 2020). The demand forecasting of seasonal clothing is an extreme challenge because the fashion and retail sector runs its business tied to a calendar date or a retailing event and develops a sales plan based on previous sales history. Since the fashion industry plans and invests funds in accordance with past sales trends, if sales are not completed due to weather changes, it is inevitable to suffer huge losses. Unexpected weather patterns can lead to extended payment periods, significantly damaging the entire supply chain system.

Methodology

Environmental Scanning and Issues Validation

Environmental scanning provides proactive insight into opportunities and threats by obtaining information about events, trends, and relationships in a company's external environment (Choo, 2001). It also protects the company from unforeseen circumstances and helps plan its future business path. There are several ways to gather information for environmental scans. One of the most commonly used data is from national and local newspapers (Weigel, Fetsch, Jenson, Yang, & Rogers, 1992). Analyzing the collected information and extracting meaning is essential for environmental scanning. Environmental scanning generally has five dimensions: economic, technological, environmental, political, and social (Deshier, 1988). Since strategic management and environmental scanning are essential means of adapting to changes in the external environment, this study focuses on the environment, which is the weather, among the five environmental scanning dimensions. Uncertainty about the weather, the environmental component of environmental scans, is critical to corporation decision-makers, especially in the fashion industry.

Grounded Theory Process

The methodology of this study is followed by grounded theory, a qualitative method to study a particular phenomenon and discover new concepts based on the collection and analysis of actual data (Corbin & Strauss, 2008; Harry, Sturges & Klinger, 2005). The process of grounded theory usually involves multiple iterative and ongoing steps. The main steps in the grounded theory process are data collection, open coding, and axial coding.

Data Collection. The complaint, whether subjective experience or not, expresses dissatisfaction or an unacceptable situation (Kowalski, 1996). This study focused on the weather, one of the external factors that companies cannot control among the five environmental scanning dimensions. Therefore, this study used newspaper articles expressing dissatisfaction with disappointing product sales due to weather as environmental scanning tools. From 2000 to 2020, newspaper articles were searched using keywords in using Naver, a search engine developed in Korea. Twelve search keywords are ‘fashion & weather,’ ‘fashion & meteorology,’ ‘fashion & climate change,’ ‘clothing & weather,’ ‘clothing & meteorology,’ ‘clothing & climate change,’ ‘retailing & weather,’ ‘retailing & meteorology,’ ‘retailing & climate change,’ ‘sales & weather,’ ‘sales & meteorology,’ and ‘sales & climate change.’ It excluded advertisement and promotional articles that do not meet the purpose of analysis, articles that consist only of photos and titles without the body of content, and duplicate articles. Through this manual exclusion process, the final study sample for coding was 798 news articles from 20 media. The manual exclusion process and article resources are illustrated in Figure 3.

Open Coding. It involves breaking data into smaller parts and assigning code to them. These codes are usually descriptive and are used to classify data. The simplest method among the text mining techniques, text frequency (TF) analysis, was used to find the words used as headlines for newspapers related to the weather and fashion industry from 2000 to 2020. A unified word with a similar meaning was changed into a single word in the data cleansing process. After the data cleansing process, the terms were classified according to the research purpose (Gioia, Corley, & Hamilton, 2012). The name of a specific product and the name of a particular store or brand was changed to generic

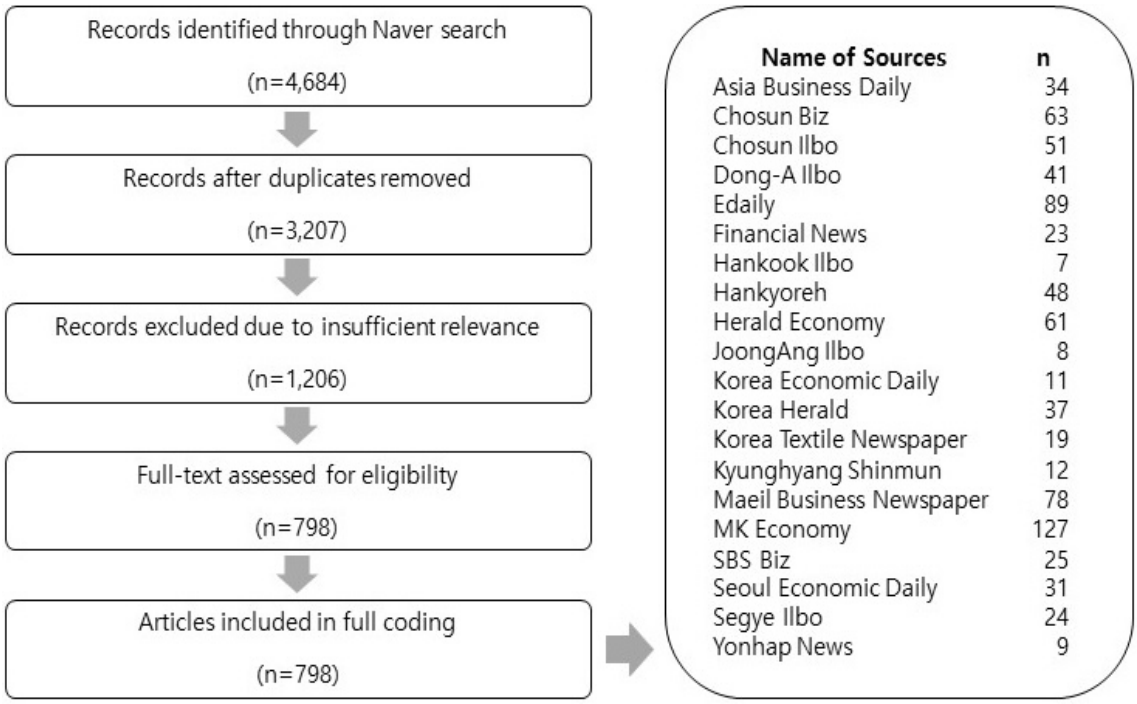

Figure 3. Flowchart summary of the sampling process

terms, and the word is included if it appears once in TF analysis but relates to weather or climate. Although the word is less frequent in the data, it can be a weak signal, which refers to information that can influence unexpected decisions, initiate opportunities, or avoid unexpected threats ahead of time (Ansoff, 1975). Finally, after the data cleaning process, the words related to weather or climate and the fashion industry were included in the following analysis. Figure 4 shows a list of words and their frequency. The size of a word shows how often it is used. It consists of those related to the weather, those related to fashion products, those related to management, and those related to economic, environmental, and social issues. Since this study focuses on the weather and the fashion industry, terms related to economic and social issues were excluded from the analysis, and the result of the frequency of words about weather events is in Figure 5. Weather, temperature, weather change, and climate change are general terms that do not describe specific weather events and conditions, so headlines from 147 newspapers, including the above words, were excluded from the next step.

Axial Coding. Axial coding involves finding relationships between cordings. Figure 6 shows the steps. The first step is to list all weather-related complaints from 651 newspaper headlines. In the second step, weather events are classified according to the effects of weather events on the fashion and retail sectors. The factor is related to the production and supply schedule of fashion products, the factor is related to the product development design, and the factor is a relatively temporary event that impacts retail store operation. The third step is to label a name as a season-related, temperature-related, and non-temperature-related complaint. The season-related complaints are 55.6% (n=362). It is a decisive factor in the timing of production, procurement, and launch of the product at a store and in quantity relative to the duration of the season. The temperature-related complaints are 36.7% (n=239). This factor is influential in developing materials, season-related items, and the product's design. The non-temperature-related complaints are 7.7% (n=50) and are relatively short-period weather events related to store operation strategies such as promotion, display, advertising, and service.

Figure 4. Word cloud of text analysis

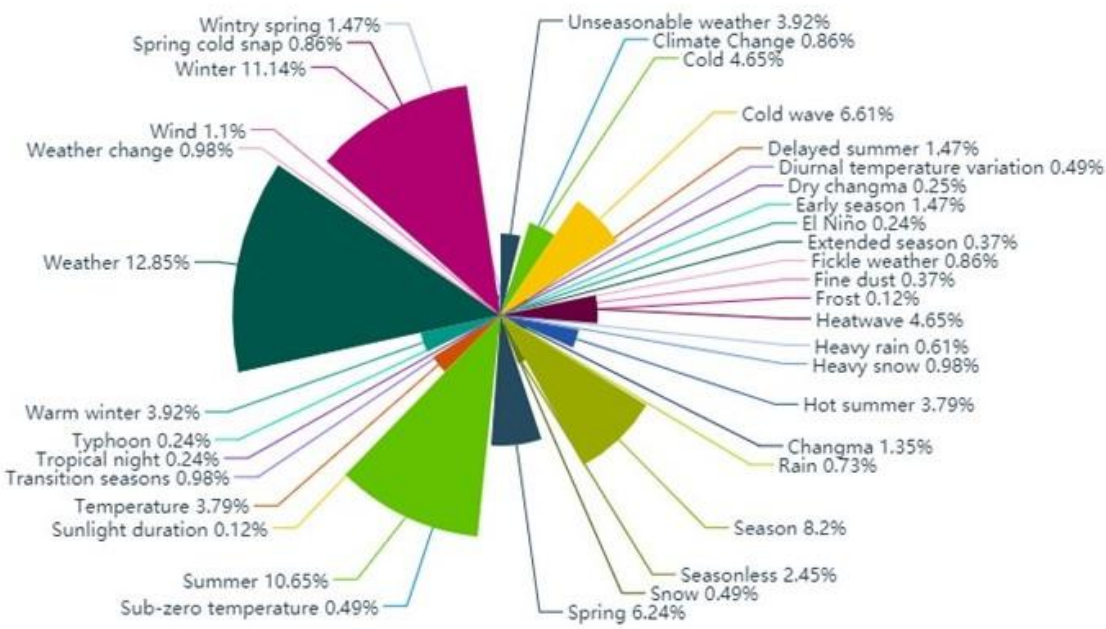

Figure 5. Frequency of words about weather events related to the fashion retail industry

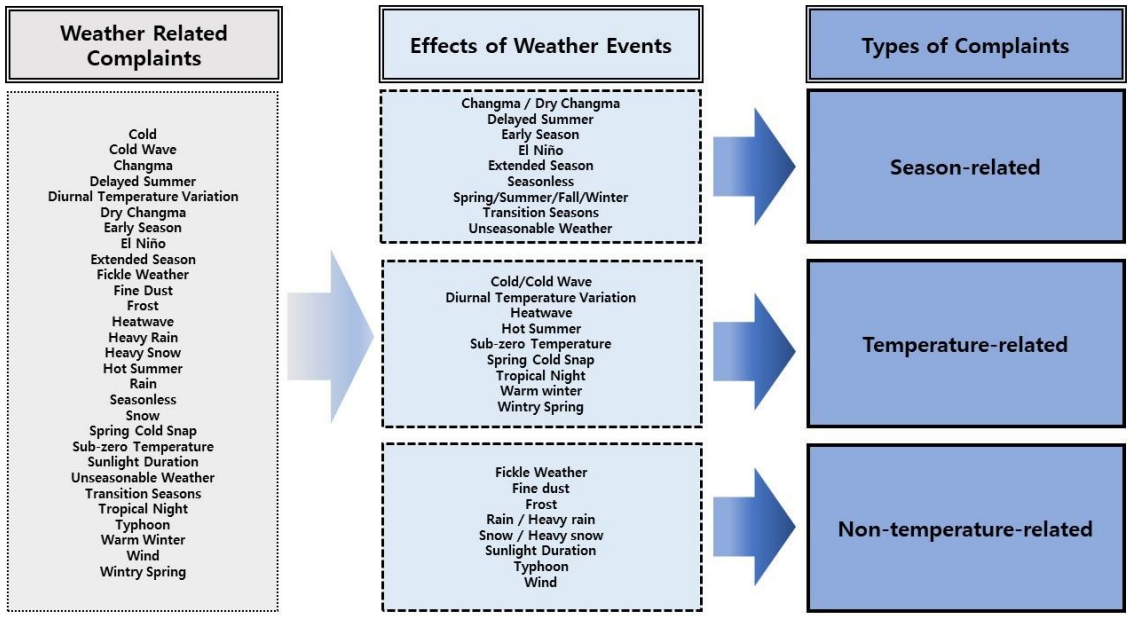

Figure 6. The classification of weather-related complaints

Results

Season-Related Complaints

Seasons are routinely classified into fixed three-month intervals (March-May in spring, June-August in summer, September-November in fall, and December-February in winter), or depending on the purpose, astronomical seasons, and weather. Of the 651 newspapers, 362 reported season-related complaints in the fashion and retail sectors. In Figure 5, among the seasons, newspaper headlines were mentioned in the order of winter (26.80%, n=97), summer (25.69%, n=93), spring (15.19%, n=55), and fall (10.77%, n=39). Seasonless, early seasons, Changma, transition, and extended seasons were also mentioned. Thus, this study discusses how the above season-related complaints affected the Korean fashion industry with the cases in the newspapers.

In the spring of 2004, the clothing market fell into recession due to the extended season, the cold wave that lasted until March, and the rapid increase in temperature in April (Cho, 2004). It is because the winter of 2003/2004 is long, and the summer of 2004 starts early. The wintry spring and early summer seasons appeared in the spring of 2008, 2010, and 2013. The spring clothing market struggled with sluggish sales and inventory (Jin, Kim, & Cheong, 2010; Kim, 2013; Park, 2008). Sales of fall clothes in 2011 and 2014 were sluggish (Lee, 2014; Song, 2011). Due to the heatwave that occurred in mid-September 2011 and the unusually high temperature in October, the start date of the fall of 2011 was not precise, and the duration of the fall was short (KMA, 2011). The duration of fall 2014 is also short due to rapid season changes. On the other hand, the fall semester of 2009 started early, and fall clothing sales were strong (Rhyu, 2009). Winter 2015/2016 is a delayed winter. Winter clothing sales were low due to mild temperatures throughout the winter of 2015/2016, but sales for winter surged due to the cold wave at the end of January 2016 (S. B. Lee, 2016; Y. M. Lee, 2016). In December 2015, the average monthly temperature recorded the highest since 1973 due to abnormally high temperatures. The average temperature in November and December was 2°C higher than the climate normal temperature. The cause of the abnormal climate was analyzed to be the influence of El Niño (KMA, 2017).

The period of Changma is the primary precipitation in

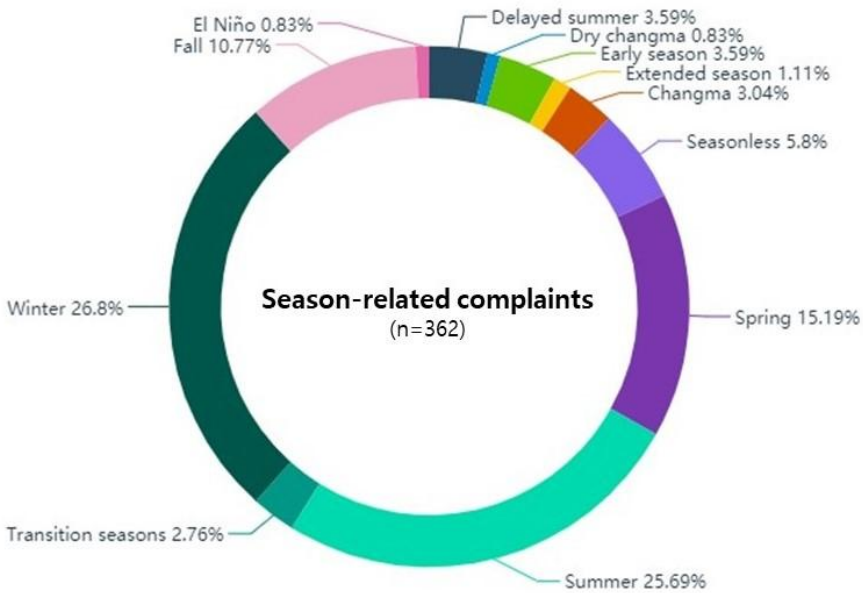

Figure 7. Frequency of season-related complaints in the newspaper headlines

Korea during the summer. Many clothing companies are making sales plans for the rainy season. In July 2011, just before the end of the long rainy season, heavy rain of more than 100 mm per hour fell in the central region, and sales of raincoats and rain boots increased by 78.1% and 127.9%, respectively, from the same period last year (Cheong, Im, Lee, & Cho, 2011). However, 2008 and 2014 were dry Changma, with little or no rain falling during the Changma period. In 2008, as the dry rainy season continued, the number of consumers visiting department stores increased, resulting in sales growth exceeding the previous year (Kim, 2008). Meanwhile, with weather forecasts predicting a long Changma and heavy rain in 2014, retailers have released more raincoats than last year. However, as the dry season continued from June to July, the distribution industry suffered difficulties (Jang, 2014). KMA provides a seasonal (3-month) outlook and a one-month outlook as a long-range forecast.

Complaints about the change in the onset dates and duration of the season were frequently mentioned. Temperature changes, especially at the beginning of the season, affected sales and overstock. The change in the duration of the season, such as delayed winter or extended summer, has been cited as an impact on sales of seasonal fashion items such as spring and fall. There were also concerns that a delay at the end of the season would affect product sales next season, reducing the value of the new product.

Temperature-Related Complaints

Of the 651 newspapers, 239 reported temperature-related complaints in the fashion and retail sectors. A cold wave (14.64%, n=58), cold (17.16%, n=41), heatwave (17.16%, n=41), warm winter (14.64%, n=35), and hot summer (13.81%, n=33) was mainly temperature-related complaints in Figure 6. Wintry spring, spring cold snap, diurnal temperature variation, sub-zero temperature, and tropical nights also were mentioned as temperature-related complaints.

The temperature was considerably higher in the fall of 2007 than in a normal year. Hence, the fashion retailer, which released fall outwears and early winter products, experienced sluggish sales of related products (Cha & Lee, 2006).

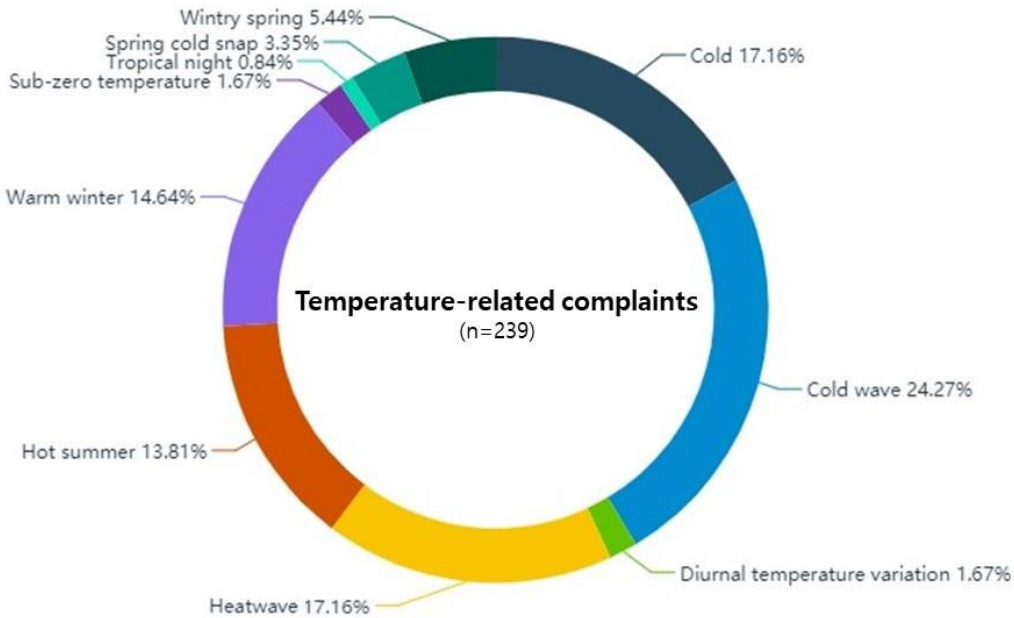

Figure 8. Frequency of temperature-related complaints in the newspaper headline

According to the Korea Economic Daily (Kim, 2012), the heat continued for several years until September, and fall clothing sales were sluggish. However, September 2012 was quite chilly in the morning and evening, and the demand for fall clothing surged in 2012. The 2010/2011 winter cold wave lasted until mid-February, so fashion companies that had a hard time selling winter clothing for years were successful in selling winter clothing (Choi, 2010). Accordingly, big national retailers announced they would release new products two weeks later, in the spring of 2011 (Park, 2011).

In October 2018, winter sales increased by more than 10% compared to the previous year (Bang, 2018). Still, overall, 2018/2019 winter was warmer than expected, and winter sales were sluggish, resulting in a surge in clothing stock (Cheong, 2019). In mid-July, the fashion and retail industry was in a mixed mood due to a heat wave of nearly 40°C. Consumers purchase summer products online or through home shopping, and sales of vacation clothing and casual have soared rather than suits (Park, 2018). Also, clothing sales with high-tech fabric and cooling effects have soared (Ji, 2018).

In the seasonal fashion market, temperature changes are very important for sales. The effect of sales due to temperature changes mentioned in newspapers is the same as in previous studies (Bertrand, Brusset, & Fortin, 2015; Bertrand & Parnaudeau, 2019; Hong & Lee, 2013; Hong, Lee, & Na, 2012; Kim, Hwangbo, & Chae, 2017; Lim & Lho, 2018; Martinez-de-Albeniz & BelKaid, 2021). Early-season temperature changes affect product sales, with sales of spring/summer products increasing as temperatures warmer and fall/winter products increasing as temperatures cooler. Also, in extreme temperature changes, materials to adapt to temperature or fashion items for other purposes were sold.

Non-Temperature-Related Complaints

Of the 651 newspapers, 50 reported non-temperature-related complaints in the fashion and retail sectors. Figure 7 shows non-temperature-related complaints. Wind (19.61%, n=10), heavy snow (17.65%, n=9), fickle weather (15.69%, n=7), rain (11.77%, n=6), heavy rain(11.77%, n=6), and snow (8.7%, n=5) are mainly mentioned. Fine dust, typhoon,

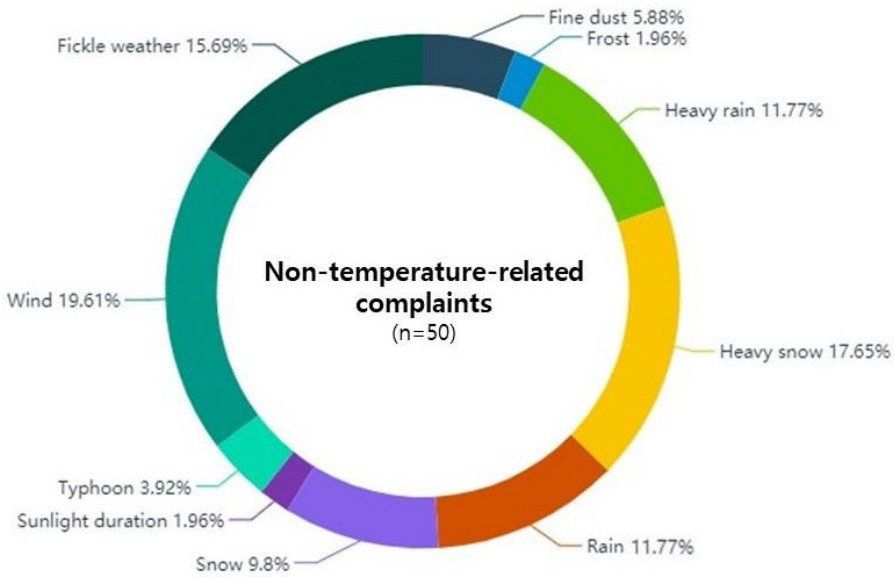

Figure 9. Frequency of non-temperature-related complaints in the newspaper headlines

sunlight duration, and frost is also mentioned. Research related to rain and snow has been going on for a long time, and in general, snow and rain hurt sales (Chu, Kim, & Choi, 2013; Hong & Lee, 2013; Martinez-de-Albeniz & BelKaid, 2021; Roth Tran, 2019). However, now that home shopping and online shopping have become popular, the results are showing differently depending on the type of store (Kim, 2001).

Department store sales were harmed the day of the heavy snow as well as the next day, but in January 2010, due to the heavy snowfall that fell for the first time in 100 years, online and home shopping sales increased, and winter jackets and clothing sales surged (Lee & Kim, 2010). On April 3, 2012, it snowed in the central region of Korea, and strong winds blew across the country even after a heavy snow warning was issued in some regions. Hence, the wind chill temperature in April was below zero (Lee, 2012). Due to such anomalies, spring clothing could not be sold on time, resulting in increased overstocks and a decrease in the profits of fashion companies as they sold at a markdown price.

Among the various air pollutants, fine dust is the most concerning health. Internationally, the level of fine dust pollution in Korea is very high (Statistics Korea, 2021). As interest and concerns about the fine dust concentration increase, Korean consumers refrain from outdoor activities on days with high fine dust concentration (Lee, Park, Han, & Kim, 2020), which has been shown to affect clothing sales (Hwangbo, Kim, & Chae, 2017). Sales in April 2017 were lower than expected because consumers were reluctant to go out due to severe fine dust (Park, 2017).

Compared to seasons and temperatures, non-temperature-related complaints were mentioned related to store promotion events and customers' store traffic, and they are a relatively short-term impact on overall sales. Traditional holidays and social events are heavily related to the physical calendar. Especially the promotional events of brick-and-mortar stores were challenging since climate change-induced weather change is frequent and extreme.

Conclusions

Climate change-induced weather change is expected to accelerate in Korea. Accordingly, these unexpected weather

events caused will have a more significant impact on the Korean fashion and retail industry. This study extracted complaints from Korean newspapers from 2000 to 2020 to identify weather-related complaints in the fashion and retail sectors. Weather complaints were classified into season-related, temperature-related, and non-temperature-related according to the effects of weather events, and each category was examined through newspaper articles to see how the weather affected the industry. Therefore, strategies to overcome each classified weather complaint are presented below.

First is season-related complaints. There were complaints about the change of onset date and duration of seasons. In particular, the beginning of summer and winter affects sales and stock management. If the end of the season is delayed, it affects the sales of products for the next season, which reduces the value of the new product. Fashion retailers need to modify their business plans according to weather changes. It should reflect the trend of accelerating and lengthening spring and summer. At the same time, trends in weather changes should be considered in determining the volume of seasonal clothing production. The second is a temperature-related complaint. Temperatures that go against seasonal forecasts, for example, warm winter, cause a significant loss to the entire supply chain. Therefore, fashion product developers must use weather forecasts to obtain seasonal temperature information in design and material development. In addition, it will be possible to solve the temperature problem by providing multi-purpose clothing suitable for various weather conditions with an aesthetic effect. The last one is non-temperature-related complaints, most predicted within 48 to 24 hours through daily or nowcast short-term forecasts. Non-temperature-related weather events can be used for weather for local businesses, especially retailers, to promote an event and product in stores and labor schedules related to customer traffic.

In the fashion industry, a calendar for a year is set according to items related to product planning, production, and sales for each season. Product category determines production volume by integrating the potential for sales growth concerning market size, the company's market share, and economic conditions (e.g., consumer price index, gross domestic product, unemployment rate, etc.) by season. Fashion retailers mainly use holidays and social events, including determining the release time of new season products based on the calendar. If seasonal changes did not occur when seasonal products were launched, new seasonal items would not have attracted consumers' attention. In addition, due to the nature of fashion, where the duration of a trend is getting shorter, and the speed of a trend is accelerating, the longer the display period in a store, the lower the value of a new product. Weather information is provided as yearly forecast, six-month forecast, seasonal forecast, monthly forecast, weekly forecast, daily forecast, and nowcasting. Weather changes due to climate change are becoming more serious, the fashion industry, which forms a globally distributed supply chain, must use weather information to flexibly make decisions within the supply chain according to weather changes to minimize the weather risks.

Through the grounded theory, this study illustrated the complaints with weather events most frequently mentioned in the fashion retail sector. However, the final stage of grounded theory, selective coding, still needs to be investigated. This part will be studied in future work with weather observation data, which can be attributed to the various meteorological influences on the relationship between core and other categories. Also, each category of weather complaints requires further investigation using actual sales data to test the sensitivity of meteorological factors to sales demand.

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