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Characteristics on Big Data of the Meteorology and Climate Reported in the Media in Korea

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ABSTRACT

This study has analyzed applicable characteristics on big data of the meteorology and climate depending on press releases in the media. As a result, more than half of them were conducted by governmental departments and institutions (26.9%) and meteorological administration (25.0%). Most articles were written by journalists, especially the highest portion stems from straight articles focusing on delivering simple information. For each field, the number of cases had listed in order of rank to be exposed to the media; information service, business management, farming, livestock, and fishing industries, and disaster management, but others did rank far behind; insurance, construction, hydrology and energy. Application of big data about meteorology and climate differed depending on the seasonal change, it was directly related to temperature information during spring, to weather phenomenon such as monsoon and heat wave during summer, to meteorology and climate information during fall, and to weather phenomenon such as cold wave and heavy snow during winter.

Key words : Big data, Meteorology and climate, Press articles, Framing

Introduction

As access to public data has increased, more attention has been paid to the utilization value of meteorology and climate data. Public data on meteorology and climate not only provide weather information, they are also utilized for analysis, inference, and decision-making support in a number of sectors, such as agriculture, energy, transportation, services, and enterprise management. Furthermore, this type of data can create new value and synergy through fusion with other fields.

The characteristics of public data on meteorology and climate are similar to that of typical big data. Big data are available in a variety of forms that can be quickly propagated; big data also consist of large amounts of information that are difficult to store, manage, and analyze using existing methods. Moreover, big data are regarded as data sets with significant value, which can be summarized as 3Vs, volume, variety, and velocity [1]. Recently, it has become possible to analyze big data due to the development of analysis techniques and tools using various algorithms that include value. Thus, big data have also been defined by 4Vs, value, volume, variety, and velocity [2].

Meteorology and climate data include a large amount of numerical model data, observation data through satellites and radar, and long-term accumulated climate data, which are also produced and delivered using various forms (variety) and vast amounts of data (volume) in real time (velocity). These data not only provide information needed in daily living, they also possess a high utilization value in various areas that can be

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used to predict future events, which meets the criteria of big data. Meteorology and climate big data can also create fusion between meteorology and climate scientists and their counterparts in various fields through the use of scientific analysis techniques. Thus, it is important to identify how meteorology and climate big data are used in society because this information can be utilized as foundational data to inform policy decision making and promote the use of meteorology and climate big data in a variety of sectors.

Press releases from newspapers and other mass media outlets on the Internet reflect and report on government policies and enterprise utilization cases as well as citizens' opinions about this timely topic. Thus, mass media can influence public opinion and decision making as they monitor the overall utilization of meteorology and climate big data in society and re-produce images that present reality [3]. The mass media influence society by selectively configuring reality using different types of framing [4]. This is known as the cognitive framework that presents reality, or the priming effect [5], which only reports a specific agenda repeatedly [6]. Therefore, analysis of press release materials in relation to the utilization of meteorology and climate big data can identify not only the current status of that utilization based on time and social sectors, but also verify how the press frames its presentation of the data and how society views that information. This is important because it forms the basis of a discussion about the promotion of meteorology and climate big data. Analytical studies on press releases regarding the utilization of meteorology and climate big data in Korea have investigated a variety of areas, including public issues, tourism, elections, and medical sectors, and they have analyzed the viewpoints of the press by selecting various categories, such as the press, article type, subject, news source, tone of the press, and publicity, in order to analyze the framing in detail [7-12]. However, studies on the characteristics of the utilization of meteorology and climate big data have only focused on reports and presentation materials to derive the importance and implications of this topic through case study analysis. Thus, it has been difficult to identify the overall utilization pattern and cognitive status of meteorology and climate big data.

This present study aimed to determine the utilization status and characteristics of meteorology and climate big data in press releases. Toward this end, this paper presents a discussion of the framing analysis of press releases about meteorology and climate big data from 2014 and monthly utilization trends.

Data and Methods

The data used in the present study are press release materials from major daily newspapers and online news sites from January 1 to December 31, 2014. For the press release materials, newspaper scrap materials from a Korea Meteorological Administration (KMA) spokesperson, mainly based on press releases monitored daily in relation to the KMA, were utilized. In addition, materials related to meteorology, climate, and weather were collected using the integrated search service of articles in the Korea Press Foundation. As a result, a total of 208 articles that utilized meteorology and climate big data in 67 major daily newspapers and online news sites in 2014 were selected for analysis.

The meteorology and climate big data utilization cases were, primarily, analyzed by focusing on the press release status of meteorology and climate big data and monthly utilization. For the press release status, the type of press and the type of data source, as well as the relationship between the press release status and each of the eight categories selected for analysis were identified for each utilization sector, and the characteristics obtained from the analysis were investigated in detail. For the monthly utilization status of meteorology and climate big data, a utilization trend for each sector from January to December 2014 was investigated, and articles from high utilization periods were analyzed to determine the characteristics.

To ensure accurate and reliable selection of the analysis categories, prior research on press release materials was conducted. A total of eight categories were selected for content analysis as follows: type of press, article type, source of data, article author, whether or not publicity was included, whether or not a graphic was utilized, tone of the article, and the utilization sector. The definition of each category is presented below:

1) Type of press: Depending on the distribution range and content, the type of press was categorized as national, local, or financial. The news from the press, news agencies, Internet articles, and free newspaper companies were categorized as other presses.

2) Types of articles: The types of articles were categorized into straight articles, the purpose of which was only to deliver factual information, informational articles that not only covered events or phenomena but also included the opinions of reporters, background about and explanations of the issues being covered, feature articles that include the expected ripple

effects, editorials that summarize individual arguments, and interview articles that summarize company information or specific persons using a Q&A format.

3) Source of the data: The source of data was categorized into enterprises, KMA, government ministries and agencies, and research institutions and centers. In the preliminary research, KMA was selected as a distinctive source of data in comparison to government ministries and agencies and other institutions because it is closely related to the publicity of utilization of meteorology and climate big data, and the number of cases reported by KMA accounted for a significant proportion of the data. If the sources of data were extensive, due to a reporter's direct reporting, or if they were not clearly identified, they were categorized as others.

4) Article authors: The article authors were divided into journalists, experts, specialized journalists, and others. Experts refer to professors in meteorology-related departments at universities, currently incumbent or retired employees in weather forecasting enterprises in private sectors, or people associated with the KMA. Specialized journalists refer to article authors who were mentioned at the end of the articles and identified as such.

5) Publicity inclusion: The scale of publicity in the press releases was divided into not applicable, no publicity, a little publicity, and much publicity. Not applicable refers to articles based on government press releases, such as policy-related articles. No publicity refers to articles that focus on information delivery, and a little publicity refers to articles with some mention of the names of enterprises or products without exerting too much influence on information delivery. Much publicity refers to articles that focus on advertisement rather than information delivery.

6) Graphic utilization: Graphics were divided into pictures, graphs, photos, mixed used, and no graphics. In addition, a direct relationship between the inclusion of graphics and the utilization of meteorology and climate big data was identified.

7) Tone of the article: The press propensity (tone), which was determined not just by titles but also by the overall reporting style, was categorized as positive, neutral, or negative.

8) Utilization sector: The sector were categorized as construction, business management, tourism, transportation, agriculture, livestock, and fishing, leisure and sports, marketing, disaster prevention, healthcare, insurance, hydrology, energy, information services, and others.

Analysis of the Results

1. Current status of press releases about the utilization of meteorology and climate big data

1.1 Current status of the press releases

The current status of the press releases about meteorology and climate big data from January 1 to December 31, 2014 is summarized in Table 1. Straight and feature articles accounted for 48.1% and 44.7%, respectively, of the press releases related to meteorology and climate big data. Editorials (5.8%) and interview articles (1.4%) accounted for a smaller number of those types of press releases. Most of the sources of data were from government ministries, agencies, and institutions (26.9%), followed by the KMA (25.0%) and enterprises (23.1%). The majority of the article authors were journalists (92.3%). The high proportion of journalists as article authors is a problem that has frequently been mentioned in previous studies on the analysis of press releases (Kim and Lee, 2007); this refers to the lack of case studies on and in-depth analysis of the utilization of meteorology and climate big data from experts' viewpoints. Articles utilizing data from government-

Table 1. Current status of the report of big data of the meteorology and climate released in the media

Classification		Frequency	Ratio (%)
Article pattern	Straight	100	48.1
	Feature	93	44.7
	Editorial	12	5.8
	Interview	3	1.4
Data sources	Company	48	23.1
	Korea Meteorological Administration (KMA)	52	25.0
	Government ministry	56	26.9
	Research agency/center	25	12.0
	Et cetera	27	13.0
Writer	Reporter	192	92.3
	Expert	13	6.3
	Special reporter	3	1.4
Promotion	Not relevant	115	55.3
	Nothing	28	13.5
	Low	40	19.2
	Many	25	12.0
Graphic	Nothing	110	52.9
	Figure	12	5.8
	Graph	7	3.4
	Picture	64	30.8
	Mixed type	15	7.2
Tones of news	Positive	35	16.8
	Negative	8	3.8
	Neutrality	165	79.3

related institutions or the KMA accounted for a high percentage of the articles containing publicity; however, articles without publicity accounted for more than half of the articles (55.3%). The breakdown of the other articles utilizing the sources of data was: 28 articles with no publicity (13.5%), 40 articles with a little publicity that simply exposed a company's name or a product's name (19.2%), and 25 articles in which much of the publicity focused on advertisements, which was relatively small (12.0%).

A large number of straight articles limited the utilization of supportive information, such as photos, pictures, and graphs. Consequently, more than half of the articles that addressed the utilization of meteorology and climate big data did not include graphics (52.9%). However, 30.8% of the articles included photo data while only 3.4% presented detailed content with graphs and only 7.2% included a comprehensive utilization of photos, figures, and graphs (7.2%). Overall, the tone used to deliver information in the press releases was primarily neutral (79.3%); the tone in 16.8% of the articles that introduced the utilization of meteorology and climate big data was positive and 3.8% of the articles presented the utilization negatively.

Table 2. Current status of the report and article number according to kinds of the press

Classification		Number of the press	Total number of article	Average number of article
Press (total 67)	National newspaper	17	71	4.2
	Local newspaper	29	66	2.3
	Economic newspaper	13	48	3.7
	Et cetera	8	23	2.9

Fig. 1. Article type according to kinds of press.

1.2 Current status of the reporting articles by the press

The type of press investigating the utilization characteristics of meteorology and climate big was categorized into national, local, financial, and others. Among the 67 presses that introduced the utilization of meteorology and climate big data, the majority (29) were local presses. However, the mean number of articles reported per local press was the lowest (2.3 articles) (Table 2). Seventeen of the 67 presses were national. However, national presses had the largest number of articles (71); on average, this resulted in 4.2 articles per national press.

Thirteen of the 67 presses were financial presses, and the total number of articles in those presses was 48. Eight of the 67 presses were other types of presses (news agency, online newspapers, broadcast media, etc.), and 23 articles were published by presses in that category. The types of articles had different characteristics depending on the type of press (Fig. 1). More than half of the meteorology and climate big data utilization cases reported in the national and financial presses were feature articles, whereas the local and other presses had more straight articles than feature articles. This is because a large number of national and financial presses not only deliver information but also provide explanations or background information about how to discuss meteorology and climate big data utilization, whereas most local and other presses simply deliver information. In particular, most of the articles in the other presses were straight articles (87%); so in-depth articles, such as editorials or interview-format articles, were not found.

Table 3 shows the sources of data and the type of article authors based on the type of press. The percentage of the

Table 3. Data sources and writer according to kinds of the press

Classification	Data sources					Writer		
	Company	KMA	Government ministry	Research agency/center	Et cetera	Reporter	Expert	Special reporter
National newspaper	16 (22.5)	15 (21.1)	18 (25.4)	10 (14.1)	12 (16.9)	65 (91.5)	4 (5.6)	2 (2.8)
Local newspaper	6 (9.1)	25 (37.9)	18 (27.3)	12 (18.2)	5 (7.6)	59 (89.4)	7 (10.6)	0 (0)
Economic newspaper	22 (45.8)	4 (8.3)	11 (22.9)	2 (4.2)	9 (18.8)	45 (93.8)	2 (4.2)	1 (2.1)
Et cetera	4 (17.4)	8 (34.8)	9 (39.1)	1 (4.3)	1 (4.3)	23 (100)	0 (0)	0 (0)

Table 4. Promotion and tones of news according to kinds of the press.

Classification	Promotion				Tones of news		
	Not relevant	Nothing	Low	Many	Positive	Negative	Neutrality
National newspaper	37 (52.1)	8 (11.3)	20 (28.2)	6 (8.5)	17 (23.9)	3 (4.2)	51 (71.8)
Local newspaper	45 (68.2)	15 (22.7)	3 (4.5)	3 (4.5)	6 (9.1)	1 (1.5)	59 (89.4)
Economic newspaper	16 (33.3)	4 (8.3)	15 (31.3)	13 (27.1)	10 (20.8)	3 (6.3)	35 (72.9)
Et cetera	17 (73.9)	1 (4.3)	2 (8.7)	3 (13)	2 (8.7)	1 (4.3)	20 (87)

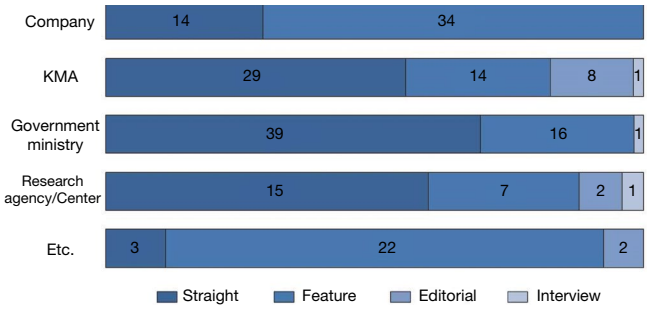

Fig. 2. Article type according to data resources.

sources of data in the national presses was relatively uniform in comparison to the data sources of the other presses. As such, 25.4% of the national presses used data from government ministries, agencies, and institutions followed data from enterprises (22.5%) and data from the KMA (21.1%). The breakdown for the percentage of sources of data for local presses was: government ministries, agencies, and institutions (27.3%) and the KMA (37.9%); this accounted for more than half of all cases. For the financial presses, enterprises (45.8%) were the source most often used to obtain data; this high percentage is due to the characteristics of specialized financial presses. For the other presses category, 39.1% obtained data from government ministries, agencies, and institutions or the KMA (34.8%). The percentage of the sources of data for this category of presses is similar to that of the local presses. For all press categories, the overwhelming majority of the article authors were journalists. The breakdown of articles written by meteorology and climate experts was: 10.6% for local presses, 5.6% for national presses, and 4.2% for financial presses. Only two of the articles in the national presses were written by specialized journalists and only one article in the financial presses was written by a specialized journalist. The authors of the articles written for other presses were not studied.

Table 4 presents the results for publicity inclusion and differences in tone of the press in the meteorology and climate big data utilization cases based on the type of press. A high percentage of articles without publicity were found in press releases utilizing meteorology and climate big data in all of the presses. This was because most presses utilized data from government ministries, agencies, and institutions and the KMA. In contrast, financial presses where likely to obtain sources of data were from enterprises, and they had a relatively higher proportion of articles that contained publicity compared to the other presses. In terms of tone, more than 70% of the articles were neutral toward the utilization of meteorology and climate big data, and more than 20% of the articles in the national and financial presses had a positive tone Each of these presses had three or fewer articles with a negative tone.

1.3 Current status of the sources of data

The investigation of article types based on the source of data showed that, when data from the KMA, government ministries, agencies, and institutions, and research institutions and centers were utilized, straight articles accounted for more than half of all the articles because the articles were written based on press releases (Fig. 2).

In contrast, feature articles accounted for 70.8% of the source of data from enterprises and 81.5% of the other sources of data, which is relatively high. When data from the KMA were utilized, 15.4% of the articles were editorials. However, overall, the number of editorials and interview articles were minimal for all sources of data.

The utilization of graphics in articles about meteorology and climate big data and the impact of that direct relationship are summarized based on the sources of data (Table 5). The summary shows that more than 45% of the articles did not include graphics, except for the cases in which other sources of data were used. Among the articles that included graphics, government ministries, agencies, and institutions were the highest sources of data (67.9%), followed by the KMA (55.8%). The under-utilization of graphics was particularly evident in a group where the number of straight articles was high. A photo was the most utilized graphic type, accounting for 25% or

Table 5. Graphic application and its relation to the application of big data of meteorology and climate according to data resources

Classification	Graphic					Relation	
	Figure	Graph	Picture	Mixed type	No	Yes	No
Company	2 (4.2)	2 (4.2)	16 (33.3)	6 (12.5)	22 (45.8)	11 (42.3)	15 (57.7)
KMA	1 (1.9)	1 (1.9)	16 (30.8)	5 (9.6)	29 (55.8)	9 (39.1)	14 (60.9)
Government ministry	3 (5.4)	1 (1.8)	14 (25)	0 (0)	38 (67.9)	5 (27.8)	13 (72.2)
Research agency/center	1 (4)	0 (0)	10 (40)	2 (8)	12 (48)	6 (46.2)	7 (53.8)
Et cetera	5 (18.5)	3 (11.1)	8 (29.6)	2 (7.4)	9 (33.3)	9 (50)	9 (50)

Table 6. Promotion according to data resources

Classification	Promotion			
	Not relevant	Nothing	Low	Many
Company	1 (2.1)	1 (2.1)	23 (47.9)	23 (47.9)
KMA	48 (92.3)	2 (3.8)	2 (3.8)	0 (0)
Government ministry	54 (96.4)	2 (3.6)	0 (0)	0 (0)
Research agency/center	10 (40)	10 (40)	5 (20)	0 (0)
Et cetera	2 (7.4)	13 (48.1)	10 (37)	2 (7.4)

Table 7. Number of the application example of field according to kinds of the press

Classification	National newspaper	Local newspaper	Economic newspaper	Et cetera
Information service	20 (28.2)	8 (12.1)	8 (16.7)	5 (21.7)
Management	12 (16.9)	4 (6.1)	14 (29.2)	2 (8.7)
Agriculture, livestock, fishing industry	6 (8.5)	18 (27.3)	2 (4.2)	1 (4.3)
Prevention	8 (11.3)	7 (10.6)	6 (12.5)	3 (13)
Public health	6 (8.5)	4 (6.1)	4 (8.3)	1 (4.3)
Transportation	3 (4.2)	2 (3)	6 (12.5)	3 (13)
Et cetera	3 (4.2)	5 (7.6)	2 (4.2)	1 (4.3)
Leisure/Sport	3 (4.2)	4 (6.1)	1 (2.1)	3 (13)
Marketing	2 (2.8)	4 (6.1)	2 (4.2)	1 (4.3)
Tour	1 (1.4)	5 (7.6)	0 (0)	1 (4.3)
Insurance	3 (4.2)	0 (0)	2 (4.2)	0 (0)
Construction	2 (2.8)	1 (1.5)	1 (2.1)	0 (0)
Hydrology	2 (2.8)	2 (3)	0 (0)	0 (0)
Energy	0 (0)	2 (3)	0 (0)	2 (8.7)

more in all sources of data. However, when graphic data were included, more than half of the graphics were not directly related to the utilization of meteorology and climate big data. This is because reference photos were used in many of the articles without directly relating the photos to the information contained in the articles, or background photos, such as clouds, rain, an umbrella, and a thermometer, were used.

Differences in publicity based on the source of data were investigated to determine the presence and level of publicity in press releases utilizing meteorology and climate big data (Table 6). Of the press releases that contained a little publicity and much publicity, 47.9% utilized data from enterprises, indicating that most of the articles included publicity. Since data from the KMA and government ministries, agencies, and institutions primarily aimed to provide information, more than 90% of the articles that used data from those sources contained no publicity, while 40% of the data from research institutions and centers was not related to publicity and 40% of the articles did not contain publicity. Although approximately a half of the articles using other sources of data contained publicity, they contained very little of it.

1.4 Current status of press releases by sectors of utilization of meteorology and climate big data

The information service sector that contributes to improvements in quality of life and convenience of daily living had 41 articles (19.71%), which was the largest percentage among the sectors utilizing meteorology and climate big data. This sector was followed by the business management sector (32 articles, 15.38%) and the agriculture, livestock, and fishing sector (27 articles, 12.98%) (Fig. 3). The disaster prevention sector for the minimization of weather-related risk and preemptive prevention had 24 articles on utilization of big data (11.54%). Overall, the utilization in the other sectors, such as healthcare, transportation, leisure and sports, and marketing, was low (8% or lower).

The analysis of the number of articles that utilized meteorology and climate big data showed that national presses had a relatively high percentage of articles in the information services, healthcare, insurance, construction, and hydrology sectors (Table 7). As presented in the table, agriculture, livestock, and fishing, leisure and sport, local marketing, and tourism, whose spatial scope is relatively limited to local areas, were the sectors most often represented in the local presses, while management, disaster prevention, transportation, and insurance sectors, which are significantly associated with economic activities, were most often represented in the financial presses. Thus, the current status of press releases specifically reflected the characteristics based on the distribution scope

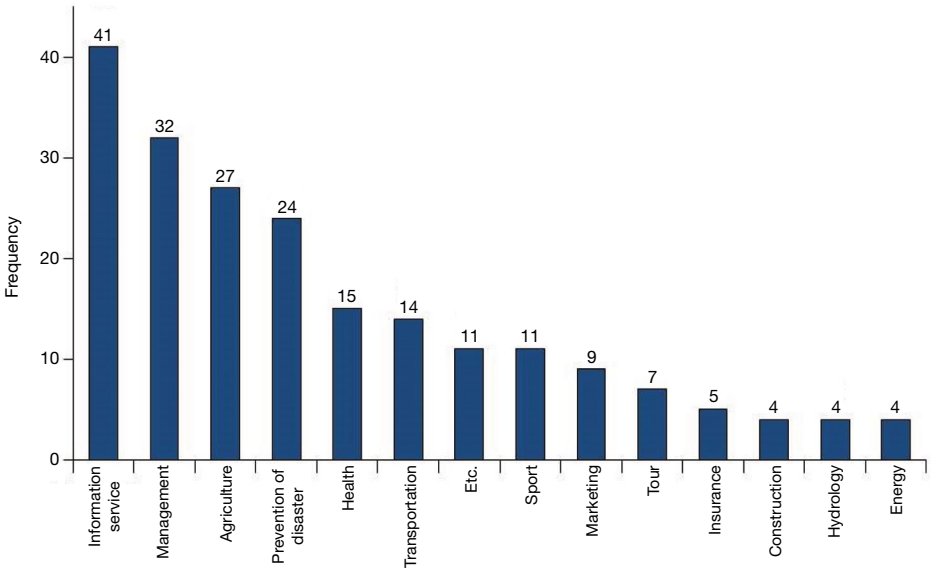

Fig. 3. Application number according to field of big data of meteorology and climate.

Table 8. Number of the application example of field according to data sources

Number of field	Company	KMA	Government ministry	Research agency/center	Et cetera
Information service	11	17	7	2	4
Management	19	6	3	1	3
Agriculture, livestock, fishing industry	1	6	11	7	2
Prevention disasters	1	4	9	6	4
Public health	2	1	7	3	2
Transportation	3	2	6	2	1
Et cetera	0	3	3	2	3
Leisure/Sport	0	5	4	0	2
Marketing	8	1	0	0	0
Tour	0	4	2	0	1
Insurance	1	0	0	1	3
Construction	2	0	1	1	0
Hydrology	0	1	1	0	2
Energy	0	2	2	0	0

and specialty.

The analysis of the number of cases that utilized big data by sectors showed that the number of cases that used data provided by the KMA (17 articles) was the largest in press releases in the information service sector, followed by data from enterprises (11 articles) and government ministries, agencies, and institutions (7 articles) (Table 8). The business management and marketing sectors used data provided by enterprises more often than the other sectors, while most of the data used by the sectors of agriculture, livestock, and fishing, disaster prevention, healthcare, and transportation, which are related to nationwide citizens, was obtained from government ministries, agencies, and institutions.

In general, articles on the utilization of meteorology and climate big data in the management and marketing sector, which primarily used data provided by enterprises, contained publicity (Table 9). The insurance and construction sectors had also a relatively high percentage of articles that contained publicity, but it was difficult to analyze the details due to the small number of cases. In contrast, overall, sectors, such as information service, agriculture, livestock, and fishing, disaster prevention, healthcare, and transportation, which used a large percentage of the data from the KMA or government ministries, agencies, and institutions, either contained information that was not applicable to publicity or did not contain any publicity at all. In the leisure and sport and tourism sec-

Table 9. Promotion and tones of news according to the application field

Classification	Promotion				Tones of news		
	Not relevant	Nothing	Low	Many	Positive	Negative	Neutrality
Information service	26	2	3	10	7	1	33
Management	9	1	18	4	11	3	18
Agriculture, livestock, fishing industry	20	6	0	1	6	1	20
Prevention	16	5	2	1	0	2	22
Public health	9	3	2	1	2	0	13
Transportation	8	1	3	2	1	1	12
Et cetera	5	5	1	0	0	0	11
Leisure/Sport	9	2	0	0	4	0	7
Marketing	1	0	3	5	0	0	9
Tour	6	0	1	0	0	0	7
Insurance	0	0	5	0	2	0	3
Construction	1	0	2	1	0	0	4
Hydrology	2	2	0	0	1	0	3
Energy	3	1	0	0	1	0	3

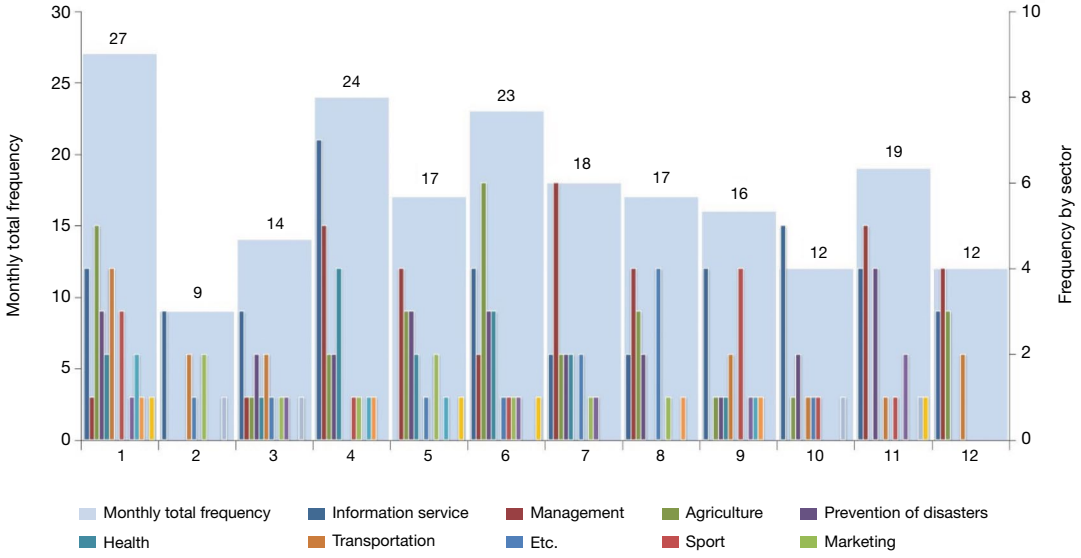

Fig. 4. Monthly total example number of big data of meteorology and climate and application example number of field.

tors, which were estimated to be closely related to advertisements, more of the articles aimed to provide information about governmental services and functions rather than advertisements; this was due to the high percentage of data from the KMA and government ministries, agencies, and institutions used in the articles. In articles that utilized meteorology and climate big data, positive tones were more often found in the information service and management sectors than in the other sectors. This resulted in a higher percentage of articles with positive tones in national and financial presses than the other types of the press. The agriculture, livestock, and fishing sector had a high percentage of articles that used data from government ministries, agencies, and institutions, which resulted in the positive tones of the articles (6 articles). In contrast, a positive tone was not found in the articles in the disaster prevention sector; in fact, two of the articles in that sector had a negative tone.

2. Characteristics of monthly utilization of meteorology and climate big data

lt of the analysis of 208 press releases in 2014 with regard to monthly utilization trend and characteristics of meteorology and climate big data showed that January was the month with the highest big data utilization (27 articles) (Fig. 4). This was because the utilization on meteorology and climate big

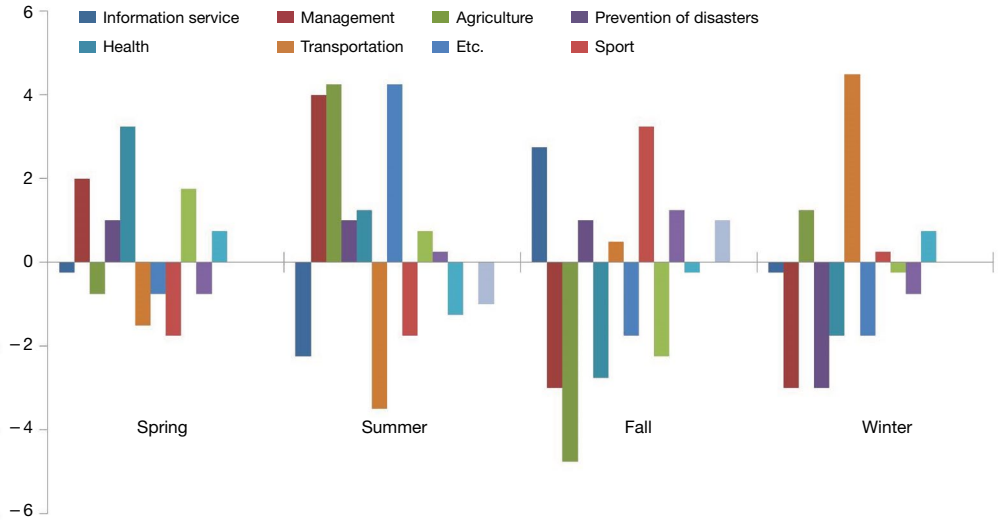

Fig. 5. Seasonal application example anomaly of big data of meteorology and climate.

data with regard to visibility, temperature, and weather conditions was dominant in the transportation sector related to road icing and aircraft safety operation, due to cold waves and heavy snow in winter. Moreover, innovation of agriculture technologies, the development of a program to prevent freezing and frost injury to fruits, and the need to provide measures to address global warming, relied on an analysis of meteorology and climate big data in the agriculture, livestock, and fishing sector.

April (24 articles, 11.54%) was the next month that showed a high utilization of big data, predominantly in the information service, weather management, and healthcare sectors. In the information service sector, interest in meteorology and climate information increased due to unpredictable spring weather, and meteorology apps and climate information were actively developed for smartphones. In the weather management sector, meteorology and climate big data was used to determine a peak sale period based on an analysis of the correlation between temperature and sales index in order to provide a marketing strategy in early summer for the logistic and fashion industries sectors. In the healthcare sector, articles utilizing meteorology and climate big data were closely related to the emergence of mosquitoes and a mosquito forecasting system due to increases in the average temperature during the spring season and high temperature phenomena, such as meteorological medicine, tropical night temperature, and scorching heat.

In June, 23 articles (11.06%) were published particularly in the agriculture and information service sectors. The agriculture sector had articles about technical development through fusion with big data and smart-customized agriculture, while the information service sector had articles about weather information due to a large daily temperature difference and early hot weather, and developments of apps to provide continual meteorology and climate information for users at their request. It was expected that, in June, meteorology and climate big data would be actively used in the management and marketing sectors by enterprises and related parties due to the start of hot summer weather and the monsoon period. However, hot summer weather started earlier than expected, so the utilization of big data in the management and marketing sectors was found in April and May.

Analysis of the utilization characteristics of meteorology and climate big data by season showed that enterprises established a spring season (March to May) peak period strategy in summer due to the early onset of hot summer temperatures. In the healthcare sector, big data was primarily used due to the emergence of mosquitoes, tropical night temperature, and scotching heat (Fig. 5). This meant that the utilization of meteorology and climate big data in the spring was closely related to temperature. The summer season (June to August) showed a difference in the utilization by sector based on the main meteorological and climate phenomena. In June, which is a month in which the temperature increases significantly, meteorology and climate big data were utilized to analyze temperature information in the agriculture sector. In July,

which is a month in which monsoons occur, meteorology and climate big data were utilized increasingly in the management sector due to the analysis of the correlation between meteorology and climate information and sales, and spending patterns. Furthermore, in August, which is a peak period of summer, climate phenomena related to tropical night temperature, scorching heat, and the late monsoon period were analyzed and actively reported on in articles related to enterprise management. The autumn season (September to November) was characterized by providing meteorology and climate information services, such as weather forecasting for mountain climbing due to an increase in the number of climbers during autumn, the inter-link with a weather information system to rescue lost climbers, the fusion of sports and weather, and the need to provide weather information support due to the opening of the Asian Games. The winter season (December to February) showed an increase in the utilization of meteorology and climate big data in relation to traffic safety, which indicated a close relationship between an increase in the utilization of big data and weather phenomena, such as cold waves and heavy snow.

The tourism, insurance, construction, hydrology, and energy sectors had also an increase or decrease in the utilization of meteorology and climate big data based on seasonal changes and monthly meteorology and climate characteristics; however, few of these types of cases were found so a long-term investigation is needed to more accurately analyze those monthly utilization characteristics.

Summary and Conclusion

In this study, 208 press releases from 67 presses in 2014 were analyzed to determine the utilization characteristics of meteorology and climate big data in the press. More specifically, the type of press, sources of data, and the utilization characteristics by sector were analyzed. The utilization characteristics based on monthly and seasonal changes were also analyzed. A summary of the study results is presented below.

First, most of the press releases regarding meteorology and climate big data were described based on data obtained from government ministries, agencies, and institutions, the KMA, and enterprises. The majority of the article authors were journalists. The unequal proportion of the sources of data affected the characteristics of the articles about meteorology and climate big data, which made it difficult to objectively judge the phenomena or provide an in-depth analysis of it. For a more balanced approach that includes many different sectors, it is necessary to select in-depth and professional meteorology and climate big data utilization cases and analyze articles written by experts or specialized journalist; it is also essential to create a joint reporting team based on the type of press, research institutions, and enterprises.

Second, the type of articles that utilized meteorology and climate big data varied depending on the type of press. Feature articles that provided information and included explanations, background information, and opinions accounted for more than 60% of all the articles in the national and financial presses. However, straight articles that focused on providing simple information accounted for more than 60% of all the articles in the local presses. It is necessary for local presses to add additional descriptions, such as explanations, background information, and the expected ripple effects, to help articles provide a more detailed understanding of the topic and increase the reader's interest.

Third, sources of data in the articles that utilized meteorology and climate big data were closely related to the type of articles, the amount of publicity included, and the tone of the press. The majority of the articles that utilized data from the KMA, government ministries, agencies, and institutions, and research institutions were straight articles, and a high percentage of them did not include publicity and they had a neutral tone. In contrast, most of the articles that used sources of data from enterprises and other sources of data were feature articles, and a high percentage of them included publicity and had a positive tone.

Fourth, more than a half of the press releases of meteorology and climate big data did not include graphics. Moreover, even if graphics were used, up to 40% of the graphic-utilized articles were not directly related to the utilization cases of meteorology and climate big data; only about 3% of the articles used tables and graphs to provide detailed information. The utilization of graphics in press releases can play a role in increasing the accessibility of articles, piquing the readers' interests; this can help provide readers with a positive, in-depth understand of the information presented. Thus, more aggressive and detailed graphic utilization is required to increase the value of meteorology and climate big data.

Fifth, the number of articles on the utilization articles of meteorology and climate big data by sector was relatively higher in the information service, business management, agriculture, livestock, and fishing, and disaster prevention sectors

and relatively lower in the insurance, construction, hydrology, and energy sectors. In sectors with a high proportion of utilization, the primary source of data was government ministries, agencies, and institutions, and relatively short-term performance-based cases were presented. In contrast, sectors with a low percentage of utilization required long-term meteorology and climate big data and analysis, and the meteorology and climate big data performance was not proven immediately. It is necessary to approach the utilization and performance of meteorology and climate big data from long-term perspectives; it is also important to generate constant interest in the utilization of this data and write articles that provide an in-depth analysis of pertinent cases.

Sixth, the analysis of the monthly utilization characteristics of meteorology and climate big data showed a difference in sectors based on seasonal changes; this difference occurred due to variations in meteorology and climate, flexibly. In particular, the business management sector was closely related to major weather phenomena, such as temperature and seasonal changes, such as hot weather in summer, monsoons, scorching heat, tropical night temperature, and late monsoons. Furthermore, a number of cases that actively utilized meteorology and climate big data were also found due to major social issues, such as mega sporting events, rather than seasonal weather phenomena. These results indicate that customized meteorology and climate big data services need to be implemented to meet users' expectations for different periods of time.

The present study provided a time-series analysis of the current status of utilization of meteorology and climate big data in the press in 2014 and it identified the characteristics by sectors. It also provided detailed information on the current utilization characteristics of meteorology and climate big data by applying framing analysis to press release data. The results of the present study can be utilized as strategic foundational data to increase the value of meteorology and climate big data and to provide direction for developing policies related to fusion service discovery using meteorology and climate big data in the future. In areas where the utilization of meteorology and climate big data is relatively insufficient, a short-term strategy should be established, and, after a pilot operation has been tested and its results validated, an advanced strategy should be implemented as a long-term strategy. Furthermore, the press and Internet media should continually introduce meteorology and climate big data that are applicable to many sectors in order to form a national consensus and increase awareness of the value of this information, as well as to underscore the importance of scientific evidence regarding the ripple effect of meteorology and climate big data. The value proliferation of and qualitative improvements in meteorology and climate big data through constant monitoring can help expand the utilization areas of meteorology and climate big data throughout society and improve the quality of life for citizens; it can also help society proactively respond to and cope with rapidly changing future environments.

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