Analysis on Cognitive Changes of Gardens between 2014 and 2018 by Big Data of Naver Channel

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ABSTRACT

Background and objective: This study analyzed the keywords related to ‘garden’ based on data in 2014 and 2018, which is before and after the enforcement of the ‘Act on the Creation and Furtherance of Arboretums and Gardens’ enacted in 2015, in order to identify the behavioral patterns and perception changes of Korean citizens about gardens.

Methods: The research scope was limited to Naver Blog, Café, and News created in 2014 and 2018, and a total of 289,214 cases (23,389 from Naver News, 41,721 from Naver Café, 224,104 from Naver Blog) were analyzed using text mining, which is a method of big data analytics. As a result of keyword analysis, the diversity of data and the amount of buzz increased by approximately 9.4% from 138,127 cases in 2014 to 151,087 cases in 2018, proving the change in public perception due to the expanded perception and policy about the scope of gardens.

Results: The result of sentiment analysis revealed that, unlike the past in which gardens were merely for tending and decorating, gardens today are undergoing changes in the patterns of use, performing more complicated roles such as taking photographs, dining, having fun, and hanging out. Gardens now coexist with commercial facilities such as restaurants or cafes where people can relax and enjoy sights or food regardless of their sizes or ownerships, which indicates that garden culture is becoming more popular in everyday places. This change is brought by government policies, implying that the nation’s legislation and policy support in expanding the garden culture has a significant impact on the patterns of garden use among people today.

Conclusion: The analysis results of this study have significance in that they more objectively show the change in citizen perception of gardens in line with the garden culture in Korea that is rapidly spreading. The results can also be effectively used in organizing various garden projects that meet the needs of garden visitors, making plans and developing programs, or managing gardens.

Keywords: arboretum and garden act, latest korean garden culture, text mining technique

Introduction

Recently, gardens have evolved into the concept of public space in the city, having a direct and indirect effect on improving the quality of life (Kwon, 2019). Gardens in the past were regarded as a place where literary writers or philosophers in the industrial society discovered nature or a meeting place shared by multiple people; and as they are used more and more for various purposes such as relaxing, healing, and education, the interest in and demand for gardens are rapidly increasing (Cho, 2018). Furthermore, as the garden culture is boosted and expanded from the
private to public domain, gardens are now creating a new form of space and culture in many areas today, such as commercial, recreational, and cultural facilities. Therefore, it is necessary to grasp the present of gardens in Korea and design an expansive future for the diffusion of a more sustainable garden culture.

In July 2015, the "Act on the Creation and Promotion of Arboretums" was amended to the "Act on the Creation and Furtherance of Arboretums and Gardens (hereinafter referred to as the Garden Act)". First, the Garden Act defines a garden as any space in which plants, soil and stones, facilities including artworks, etc. are continuously managed by displaying, placing, cultivating, or tending them, classifying gardens according to the nature of the entity that creates and manages them, and indicating that garden creation is supported by the state (The Ministry of Government Legislation, 2015). This is considered to have laid the foundation for systematically promoting and activating various policies on gardens. Various gardens such as national, local, public, private, and community gardens are created as a result of the support for garden creation, and each local government is hosting distinctive expositions and garden shows of their own. Since the enactment of the Garden Act, community garden creation projects by local governments became widespread, such as the 'Village Community Garden Project' by the Ministry of Public Administration and Security and the 'Village Creation Project with Citizen Participation' by Gyeonggi-do. This is broadening the scope of participants, such as trained citizen gardeners participating as garden interpreters at expositions and garden shows or having citizen participation programs that can involve both adults and students (Lee, 2020). Gardens not only provide a beautiful ecological environment but also play the positive role of increasing physical activity among local residents and strengthening community spirit, and thus the need and demand for gardens are bound to increase (Lee and Park, 2018).

Garden studies in Korea are mostly conducted on garden designs or plantation trends in garden expos or festivals, different types of garden designs and garden education programs, or the effects of public gardens. Big data analytics is used in various fields, which is a suitable method to analyze consumer perceptions, trends, and market flows (Lee et al., 2017). Kim (2016) reviewed the public perception and awareness of forest healing with SNS big data, and Shin et al. (2020) used big data to identify how the social, economic, and cultural perceptions of citizens change over time, with keywords such as arboretums and botanical gardens. As for big data analytics or perception analysis related to gardens, Jang (2014) limited the scope of perception analysis to Suncheonman International Garden Expo, the search scope to blogs, and the period to the duration in which the expo was held, and then came up with implications by identifying visitor preferences and perception on certain gardens and spaces. Although blog data is personal and subjective, difficult to interpret, and limited in quantifying and analyzing data, it still shows potential as a medium for perception studies. Woo and Suh (2016) identified the conceptual scope of gardens based on literature review and big data analytics, and the results implied that gardens can be made out of a residential environment or any space where interaction is possible, and that gardens play an extended role from the private to public sector in association with all fields such as personal aspects as well as society, nature, culture, and economy.

The concept of gardens in this study is extended to the public domains along with all places where plants are used, beyond the dictionary definition of a 'yard or flower bed at home' according to the National Institute of Korean Language's Standard Korean Language Dictionary, referring to gardens where extensive and diverse interpretations can be made. This study will analyze the changes in public perception of gardens before and after the enactment of the Garden Act using big data and identify the present of garden culture in Korea.

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1) Big data does not merely indicate data that is big in size, but actually refers to data in various types and size incomparable to the past. The word 'big' connotes the meaning of information asset that has data size, high speed, and great diversity (Park et al., 2019). It is a technology that can effectively manage the data exploding with the emergence of the internet, mobile technology, and SNS and extract useful information (Yoon, 2013).
Research Methods

Subjects

Data was collected from Naver News that has a public character and Naver Blog and Café that have a private character on 'Naver', the largest portal site in Korea. This considers the volume of data as well as the representativeness of Naver as the largest portal site in Korea among the massive amount of social data in Korea. As a result of data search related to 'garden', total a total of 515,072 cases (48,730 from Naver News, 58,414 from Naver Café, 407,928 from Naver Blog) of data were extracted. Among them, data unrelated to gardens (homonyms, game titles, restaurant names, National Intelligence Service, etc.) was refined, leaving a total of 294,176 cases (23,389 from Naver News, 41,721 from Naver Café, 229,066 from Naver Blog) as the subjects of this study (Fig. 1).

Methods of analysis

To identify the changes in Korean citizens' behavioral patterns and perceptions of gardens since the enactment of the Garden Act in 2015, this study derived and analyzed keywords related to gardens based on data from 2014 and 2018 before and after the enactment. In addition, it classified the texts representing subjective information such as opinions, emotions, evaluations, and attitudes among garden-related words into positive, negative, and neutral, after which a sentiment analysis was conducted to determine the tendency of public opinions about gardens as well as its change (Park et al., 2018). Sentiment analysis is the process of distinguishing emotions, which are subjective elements of text, into positive and negative emotions and quantifying them into figures, diagrams, and grades. It is also referred to as opinion mining since it can extract individual attributes and analyze the emotions, sentiments, attitudes, and perspectives of people expressing emotions (Shin, 2018).

To collect data in big data analytics and perform text mining\(^2\), this study used TousFlux, a data analysis platform based on deep learning. TousFlux is a platform that can efficiently collect and refine all kinds of data and analyze big data in a short time using an engine built based on natural language processing, image analysis, data mining, and machine learning (Goldenplanet, 2021). TousFlux was used to search the data from Naver News, Café, and Blog during the period, collect all documents and comments that include garden-related keywords, derive related words by analyzing the attributes of results, and identify the ratio of positive and negative emotions of the text that include those search words. Text mining is the process of finding the information that the researcher wants from massive data at the level of background or circumstance, not at the level of keywords (Jung, 2010), and it is a suitable method for this study that intends to identify the trend in how the public perception of gardens has changed before and after the enactment of the Garden Act. 'Garden' keywords were analyzed based on words extracted through text mining, and 5WIH, which is a classification system mostly used in articles or press releases (Jang et al., 2013), was operationally defined to develop and analyze perception survey items for garden users. As a result, the amount of buzz\(^3\) of keywords and the increase and decrease of fre-

\(^2\) Text mining: The purpose of this technology is to extract and process useful information from unstructured/semi-structured text data based on natural language processing technology (Kim, 2013).

\(^3\) Amount of buzz: It refers to the number of times the relevant keyword is mentioned within the collected data.
frequency were displayed in tables and graphs, visualized so that they can be captured more directly. Therefore, this study operationally defined 5WIH to identify the changes in public perception of gardens and analyzed the usage patterns related to garden visitors (who), visiting time (when), place of garden creation and visit (where), components of gardens (what), method of visit (how), and purpose of visit (why).

Results and Discussion

Results of analyzing garden 'keywords'

Analysis of 'garden' keywords

The amount of buzz related to 'garden' collected overall was biggest in spring (March-May, 45,328 cases), followed by fall (September-November, 39,543 cases), summer (June-August, 37,858 cases), and winter (December-February, 28,358 cases). Overall, the amount of buzz in 2018 (151,087 cases) increased by 9.4% (12,960 cases) compared to 2014 (138,127 cases) (Fig. 2). The monthly amount of buzz increased the most in April (13,603 cases in 2014 → 16,533 cases in 2018, increased by 2,930 cases) and October (12,294 cases in 2014 → 15,728 cases in 2018, increased by 3,434 cases), when garden-related cultural events such as garden expos are thriving (Fig. 2).

As a result of analyzing ‘garden’ keywords, there were many keywords such as tree, flower, tourism, and home in 2014, and keywords such as flower, plant, cafe, place, tourism, and travel showed a high amount of buzz in 2018. The general keywords did not change significantly in 2014 and 2018, but all the amount of buzz increased in all cases, and the ranking of each keyword also changed. The amount of buzz for tree was higher than flower in 2014, but flower surpassed tree in 2018, and the amount of buzz for cafe increased sharply especially in 2018 (Fig. 3). Moreover, as a result of analyzing keywords related to garden space, home and cafe were ranked high, proving that the perception of gardens has changed from a 'special space' to 'daily, close, and common place' (Fig. 8).

5WIH analysis related to 'garden' keywords

Who

The gender ratio was identified to determine garden-related visitors and data producers, and it was found that 56% were female and 44% were male, showing the same ratio in 2014 and 2018. Since this study uses data on social network, there is a difficulty in identifying the accurate age, but as a result of analyzing keywords by age based on those reflecting age levels, ‘child’ data in 2018 (14,286 cases) increased by at least 2.9 times compared to 2014 (4,881 cases) (Fig. 4). This is because family visits take up the biggest portion in visiting gardens, and parents (male and female adults) generally accompany their children. As a result of identifying companions and the number of those companions visiting the gardens, most were families (11,794), followed by individuals (10,061), friends (8,914), married couples (7,051), and couples (5,785). ‘Individuals’ showed a sharp increase (3,304 cases in 2014 → 10,061 cases in 2018, increased by 6,757 cases) in 2018. The portion of accompanying ‘companion dogs’ (589 cases in 2014 → 2,903 cases in 2018) increased as much as that of groups (908 cases in 2014 → 2,879 cases in 2018) (Fig. 5).
When
As a result of analyzing the top 15 keywords in the monthly amount of buzz, the keywords café, Jeju, and weather appeared every month; cherry blossoms appeared the most in March-April, roses in May-June, hydrangeas in June-July, pink muhly in September-October, and autumn leaves in October-November. This might have been because each organization or local government held seasonal flower events when the flowers blossomed, which is then exposed on the news and posted by visitors on the blogs (Table 1). As a result of analyzing seasonal attributes, the share of Suncheon was high in 2014, while Jeju was frequently exposed in 2018, and café took up 1st and 2nd place in all four seasons (Table 2). Chrysanthemums, ginkgo, and cosmos in the fall of 2014 was replaced by pink muhly in 2018, which is because since pink muhly was first planted in an ecological park of Jeju, a pink muhly complex was formed in the Suncheon Bay National Garden in 2016. It became popular when planted near Cheomseongdae Observatory in Gyeongju in 2017, after which it was disseminated nationwide in 2018, and posts and photos were uploaded on blogs, creating more buzz. Furthermore, the media also exposed pink muhly festivals.
Where

The region with the most data on 'garden' in Korea was Seoul (14,700 cases), followed by Jeju (7,222 cases) and Suncheon (5,463 cases) (Fig. 6). This is because Seoul is the capital of Korea where the largest population is concentrated, Jeju is a place where the landscape and tourism of the island are generally similar to gardens, and Suncheon is a place showing a high amount of buzz with the impact of the Garden Expo. As a result of analyzing the change in data volume by city and province in Korea excluding Seoul, Jeju and Suncheon, it was found that data showed a sharp increase overall in 2018 compared to 2014 (13,600 cases in all regions in 2014 → 31,510 cases in all regions in 2018). Gyeonggi-do showed the sharpest increase in data (1,726 cases in 2014 → 6,851 cases in 2018, increased by 5,125 cases), and Ulsan (Taehwagang) surged from 12th place in 2014 to 5th place (308 cases in 2014 → 2,111 cases in 2018, increased by 1,803 cases). Daegu, which had been ranked first in 2014, showed a slight increase in 2018 and fell to 6th place (1,777 cases in 2014 → 2,003 cases in 2018, increased by 226 cases) (Fig. 7).

As a result of analyzing keywords related to Seoul that shows the highest data volume, it was found that most keywords were related to outdoors such as Seoul Forest, park,
butterfly, and outing in 2014, which changed to keywords related to indoors that mention indoor gardens or container gardens created inside buildings such as cafés and spaces in 2018. This shows that the perception of gardens is expanding from outdoors to indoors (Table 3). The analysis on keywords related to Jeju showed that in 2014, specific tourist spots related to gardens were exposed, such as Jungmun Tourist Complex, Hallim Park, Ecoland, and Camellia Hill. But in 2018, words such as child (parent) or time were exposed at the top, which implied that the perception of gardens has changed into a place where families spend time together (Table 3). For Suncheon where the urban image improved in relation to gardens after hosting the Suncheonman International Garden Expo in 2013, keywords such as Suncheon Bay Garden and Garden Expo were exposed at the top in 2014, but Suncheon Bay National Garden was ranked at the top in 2018, indicating that Suncheon Bay Garden is perceived as a national garden (Table 3).

As a result of analyzing keywords related to garden space, it was found that the amount of buzz for café increased by more than 3.5 times from 2014 (4,429 cases) to 2018 (15,619 cases), indicating that the perception of gardens changed from a separate or special space to a daily space like home or café (Fig. 8). The analysis of data from 2018 showed that the perception of gardens is changing, considering that there are many texts mentioning flowers planted in pots at home or in a café as a garden. Keywords on specific spaces of creation showed that the ranking changed from rooftop (3,658 cases) > balcony (3,551 cases) > vegetable garden (1,669 cases) in 2014 to flower pot (6,978 cases) > balcony (6,984 cases) > table (5,983 cases) in 2018 (Fig. 9). This indicates that flower pots were regarded as both a garden and a subfactor of creation space, which is an extension of the role of flower pots in everyday life.

### How
The means of transportation to access the gardens changed from 2014 to 2018 in the pattern of subway (4,492 cases) > bus (4,434 cases) > car (3,444 cases) > foot (3,381 cases), flight (2,169 cases) > ship (1,726 cases). This shows that

| Topic word | Frequency | Topic word | Frequency | Topic word | Frequency |
|------------|-----------|------------|-----------|------------|-----------|
| Seoul      |           | Jeju       |           | Suncheon   |           |
| special    | 1,324     | café       | 3,947     | Jungmun    | 1,218     |
| Seoulforest| 1,258     | space      | 3,242     | outdoor    | 1,136     |
| park       | 1,023     | time       | 3,011     | Jeju       | 857       |
| construction| 1,010    | child      | 2,321     | sea        | 693       |
| butterfly  | 987       | interest   | 2,224     | pention    | 631       |
| space      | 831       | location   | 2,106     | lovely     | 610       |
| forest     | 796       | mood       | 2,098     | location   | 482       |
| location   | 740       | Jeju       | 1,999     | Hallimpark | 407       |
| outing     | 505       | special    | 1,863     | recommend  | 306       |
| citizen    | 390       | art work   | 1,521     | recommend  | 306       |
| smart      | 347       | progress   | 1,471     | café       | 253       |
| sky        | 311       | recommend  | 1,364     | child      | 192       |
| rooftop    | 309       | heart      | 1,273     | Jeju island travel | 180 |
| progress   | 286       | display    | 1,189     | stroll     | 162       |
| downtown   | 253       | park       | 1,096     | Seoggwipo-si | 145 |
| Seogwipo   | 351       | travel     | 318       | Naganepsong | 386 |

*R : Ranking *F : Frequency
gards are changing into a short-distance daily space instead of long-distance. Most traveled by train for intercity travel, and by subway (Seoul) for intracity travel. Moreover, with the impact of 'Naeillo', which is currently operating at all times but had been operating only temporarily in summer back in 2014, the amount of travel by train increased sharply in June-August (Fig. 10).

Why
According to KOSIS, the number of visitors in Suncheon, which had been 2,351,640 in 2012 before the expo, increased by approximately 60% to 3,772,253 in 2014 after the expo (National Institute of Korean Language 2021). The impact of the Suncheonman International Garden Expo in 2013 continued until 2014, and thus keywords related to expositions in 2014 were mostly about Suncheon. However, in 2018, Goyang (International Horticulture Goyang Korea) and Ulsan (Taehwagang National Garden) where events were held showed a higher amount of buzz than Suncheon (Fig. 11).

What
As a result of comparing the monthly trends with keywords such as flower, tree, and plant that are essential elements of a garden, it was found that the amount of buzz for tree was high in 2014 (60,917 cases in 2014 → 56,787 cases in 2018).

Fig. 8. A total buzz amount of five different spaces with garden in the year of 2014 and 2018.

Fig. 9. The analysis of type of garden on cognitive change.

Fig. 10. The analysis of ‘garden approach vehicle’ keyword.

Fig. 11. The analysis of ‘garden show’ keyword.
cases in 2018), but the amount of buzz for flower surpassed that for tree since April 2018 (Fig. 12). Moreover, for the plants that are perceived the most and popular in gardens, cherry blossoms in April (1,022 cases), roses in May (1,608 cases), hydrangeas in July (354 cases), chrysanthemums in October (825 cases) showed the highest amount of buzz, which are in line with the flowering time of each species (Fig. 13), and cosmos and pink muhly emerged as new popular keywords in 2018.

**Results of analyzing garden keywords**

As a result of analyzing garden-related keywords, it was found that the diversity of data and the amount of buzz increased by approximately 9.4% in 2018 compared to 2014. In particular, the growing popularity of pink muhly led to a rapid increase in the amount of buzz in fall. Moreover, by analyzing the perception of keywords related to expositions, it was revealed that policy aids and efforts (exhibitions, press releases, festivals, etc.) could change public perception. In general, the concept of gardens is expanding and is perceived as something close to everyday life such as home, café, or flower pots in 2018 beyond the concept of long distance or outdoors in 2014.

**Results of analyzing garden 'sentiments'**

**Garden sentiment analysis by year**

The analysis on emotional changes by year in 2014 and 2018 revealed that neutral (26% → 18.1%) and negative (14% → 10.8%) responses decreased, while positive responses increased by 11% from 59.9% to 71%. Compared to 2014, positive responses to 'gardens' seemed to have increased throughout all months of 2018.

The sentiment analysis on Naver Blog showed that 'various' (8th in 2014 → 4th in 2018) and 'pleasant' (14th in 2014 → 13th in 2018) rose in the ranking, while 'gardening' (7th in 2014 → 19th in 2018) and 'decorate' (13th in 2014 → 22nd in 2018) declined (Table 4). One thing to note is that the frequency of the topic word 'take' increased by about 7.6 times from 4,145 cases in 2014 to 31,437 cases in 2018, which is because gardens were frequently used as a place to take photos such as 'SNS picture', 'best photo', 'profile picture', etc. Moreover, the topic word 'eat' increased by about 10 times from 2,994 cases in 2014 to
30,656 cases in 2018, showing a high portion. While people tended to perceive gardens as a 'space to tend and decorate flowers and trees' in 2014, they considered gardens as a 'space to enjoy good food and relax' in 2018, when the keywords such as 'enjoy, delicious, rest' are ranked high, which implies that the function and perception of gardens have expanded.

The results of sentiment analysis on Naver Café also had the most positive reviews about the types of flowers and gardens, such as 'good' (3,787 cases), 'pretty' (1,816 cases), and 'beautiful' (1,745 cases). The rise of 'various' and 'pleasant' in the search word ranking proves that there are positive reviews about various new experiences through gardens (Table 4). Moreover, the rise of topic words such as 'visit', 'sow', and 'raise' in the ranking proves that, due to the nature of Naver Café, leaving reviews after visiting gardens and actively sharing information about sowing and raising plants in the garden lead to a positive impact on the perception of gardens.

The results of sentiment analysis on Naver News showed that 'wide' declined in the ranking, while 'full' (12th in 2018) and 'harmony' (13th in 2018) that had not been included within the top 15 rose in the ranking. This might be because many press releases mentioned that gardens are full of various beautiful plants rather than emphasizing the size of gardens (Table 4). Moreover, the words 'opened' or 'open' proved that most reports are on hosting various events on gardens.

### Garden sentiment analysis by place

In 2014, the most frequently mentioned place related to gardens was 'Suncheon' (7,150 from Naver Blog, 549 from Naver Café, 2,486 from Naver News), which recorded the highest frequency in all channels including Blog, Café, and News, followed by 'Jeju' (Jeju, Jeju Island combined; 5,318 from Naver Blog, 236 from Naver Café, 253 from Naver News) and 'Seoul' (1,977 from Naver Blog, 174 from Naver Café, 598 from Naver News). In 2018, 'Jeju' and 'Jeju Island' showed the highest frequency (Jeju, Jeju Island combined; 18,718 from Naver Blog, 762 from Naver Café, 730 from Naver News), followed by 'Suncheon' (10,308 from Naver Blog, 2,389 from Naver News), 'Seoul' (18,761 from Naver Blog, 541 from Naver Café, 1,785 from Naver News), and 'Gyeonggi-do' (5,968 from Naver Blog, 290 from Naver Café, 481 from Naver News).

For Seoul, the number of neutral and negative words decreased in 2018 compared to 2014, and the number of positive words increased significantly to 81.24%. Considering that the topic word 'delicious' has increased significantly from 26th in 2014 to 6th in 2018, the perception of gardens

### Table 4. Positive topic word analysis ‘2014 vs 2018’

| R | 2014 | 2018 | Note | 2014 | 2018 | Note | 2014 | 2018 | Note |
|---|---|---|---|---|---|---|---|---|---|
| Blogs | | | | | | | | | |
| 1 | good | 12,056 | good | 91,237 | ▲ | | 1 | good | 1,852 | good | 3,787 | ▲ | |
| 2 | beautiful | 10,056 | pretty | 43,126 | ▲ | | 1 | beautiful | 1,325 | pretty | 1,816 | ▲ | |
| 3 | pretty | 9,034 | beautiful | 25,987 | ▼ | | 1 | pretty | 1,286 | beautiful | 1,745 | ▼ | |
| 4 | bloom | 6,694 | various | 18,436 | ▲ | | 1 | bloom | 1,037 | bloom | 1,351 | ▼ | |
| 5 | lovely | 4,401 | bloom | 19,013 | ▼ | | 1 | wide | 616 | various | 1,000 | ▲ | |
| 6 | wide | 4,213 | lovely | 17,830 | ▼ | | 1 | lovely | 597 | wide | 936 | ▼ | |
| 7 | gardening | 3,715 | enjoy | 16,376 | ▲ | | 1 | gardening | 567 | gardening | 796 | ▲ | |
| 8 | various | 3,519 | nice | 14,796 | ▼ | | 1 | beautiful | 537 | garden | 976 | ▲ | |
| 9 | nice | 3,311 | beautiful | 14,364 | ▼ | | 1 | various | 537 | green | 796 | ▲ | |
| 10 | recommend | 2,780 | recommend | 12,129 | ▲ | | 1 | recommend | 355 | recommend | 580 | ▲ | |
| 11 | ornament | 2,662 | nice | 10,768 | ▼ | | 1 | nice | 372 | nice | 595 | ▼ | |
| 12 | enjoy | 2,476 | feel | 8,901 | ▲ | | 1 | recommend | 355 | recommend | 580 | ▲ | |
| 13 | decorate | 2,365 | pleasant | 7,807 | ▼ | | 1 | decorate | 327 | decorate | 505 | ▼ | |
| 14 | pleasant | 1,588 | rest | 6,004 | ▼ | | 1 | through | 277 | pleasant | 420 | ▼ | |
| 15 | green | 1,537 | warn | 6,488 | ▼ | | 1 | pleasant | 269 | full | 393 | ▼ | |

*R: Ranking *F: Frequency *(C): (Changes in ranking)
in Seoul had a high correlation with 'cafe' and 'restaurant' (Table 5). Moreover, 'walk' fell from 11th in 2014 to 15th in 2018, and 'sit' rose sharply from 25th to 14th, which shows that the perception of gardens is changing from a 'space to walk and experience' to a 'space to sit and relax'. On the other hand, 'hard' increased for negative words, which is due to the lack of rest area at festivals compared to visitors.

For Gyeonggi, the words 'gardening' (7th in 2014 → 20th in 2018) and 'decorate' (13th in 2014 → 23rd in 2018), which are expressions for directly decorating a garden, declined sharply, whereas while 'play' (30th in 2014 → 12th in 2018) and 'enjoy' (26th in 2014 → 7th in 2018) increased, indicating that gardens are changing toward embracing the features of both play and recreation (Table 5). The negative topic word 'not know' was ranked second in the frequency of negative topic words in both 2014 and 2018. This is mostly used when visitors want to know the names of plants planted in the garden and more information related to plants.

For Jeju, topic words about managing gardens were ranked at the top in terms of frequency, such as 'decorated' (9th) and 'gardening' (14th), in 2014. On the other hand, in 2018, positive topic words such as 'delicious' (21st in 2014 → 7th in 2018), 'neat' (17th in 2014 → 11th in 2018), and 'comfortable' (26th in 2014 → 14th in 2018) were ranked higher in cafes or restaurants with gardens (Table 5). In addition, the rise of topic words such as 'take' (6th in 2014 → 3rd in 2018), 'eat' (15th in 2014 → 4th in 2018), and 'visit' (30th in 2014 → 14th in 2018) proves that people today perceive gardens not just as a place to look at but as a place to take pictures, share experiences, and enjoy food during the visit.

### Results of garden sentiment analysis

The results of sentiment analysis showed that topic words such as 'delicious', 'eat', and 'rest' suggest that, as cafes with gardens are increasing, the leisure culture at a commercial facility such as relaxing and enjoying coffee and refreshments at a garden inside the cafe is becoming more popular. Gardens are more accessible than parks or arboretsums and do not charge additional admission fees. Thus, they are developing in line with the contemporary trends of 'sohwakhaeng', which means small but certain happiness in everyday life, or 'gasimbi', which means cost-to-satisfaction ratio. Moreover, topic words such as 'fun', 'enjoy', and 'visit' proved that there is a change in perception from the garden culture where gardens play the simple role of decorating and tending to the garden culture where gardens play more complicated roles such as providing the venue for people to visit and enjoy spaces that are decorated with

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**Table 5. Positive topic word analysis as to location**

|     | Seoul 2014 | 2018 | Note | Gyeonggi 2014 | 2018 | Note | Jeju 2014 | 2018 | Note |
|-----|------------|------|------|-------------|------|------|-----------|------|------|
| R   | Topic Word | F    |      | Topic Word  | F    |      | Topic Word | F    |      | Topic Word | F    |      |
| 1   | good       | 12,006 | good | 91,237   |      | -    | good       | 1,852 | 3,787 |       | good       | 806  | 2,662 |      |
| 2   | beautiful  | 10,006 | pretty | 43,126 | ▲ 1  | beautiful | 1,325 | 1,816 | ▲ 1  | beautiful | 665  | 1,706 | ▲ 1  |
| 3   | pretty     | 9,034  | various | 25,987 | ▲ 1  | pretty   | 1,286 | 1,745 | ▲ 1  | pretty   | 468  | 1,445 | ▼ 1  |
| 4   | various    | 6,694  | beautiful | 18,436 | ▼ 2  | various  | 1,037 | 1,351 | ▲ 1  | wide     | 414  | 913   | ▲ 4  |
| 5   | enjoy      | 4,401  | enjoy  | 19,033 |      | -    | wide       | 616   | 1,000 | ▲ 19 | delicious | 343  | 835   | ▼ 1  |
| 6   | bloom      | 4,213  | delicious | 17,380 | ▲ 20 | full    | 597   | beautiful | 936   | ▼ 4  | nice      | 306  | 802   | ▼ 1  |
| 7   | wide       | 3,715  | wide   | 16,376 |      | -    | bloom      | 586   | enjoy  | 914   | ▲ 1  | bloom    | 237  | 603   | ▲ 14 |
| 8   | lovely     | 3,519  | lovely  | 14,796 |      | -    | lovely     | 567   | 796   | ▲ 3  | lovely    | 223  | 580   | ▼ 1  |
| 9   | ornament   | 3,311  | bloom   | 14,364 | ▼ 3  | ornament | 537   | nice    | 796   | ▲ 4  | ornament  | 217  | nice   | ▼ 3  |
| 10  | nice       | 2,780  | nice   | 12,129 |      | -    | gardening  | 381   | bloom   | 650   | ▼ 3  | full      | 196  | feel   | ▲ 1  |
| 11  | gardening  | 2,662  | feel   | 10,768 | ▲ 4  | lovely   | 372   | feel    | 595   | ▲ 8  | feel      | 186  | neat   | ▲ 6  |
| 12  | full       | 2,476  | pleasant | 8901  | ▲ 4  | 4  | 355   | 580   | ▲ 18 | decorate  | 181  | pleasant | ▲ 3  |
| 13  | decorate   | 2,365  | full   | 7,807  | ▲ 1  | nice    | 327   | neat    | 505   | ▲ 15 | harmony   | 172  | full   | ▼ 3  |
| 14  | green      | 1,588  | rest   | 6,604  | ▲ 9  | decorate | 277   | pleasant | 420   | ▼ 2  | gardening | 165  | peaceful | ▲ 12 |
| 15  | feel       | 1,537  | warm   | 6,488  | ▲ 10 | 5  | close   | 269   | 393   | ▲ 7  | pleasant  | 161  | ornament | 375  | ▼ 6  |

*R: Ranking *F: Frequency *(C): (Changes in ranking)
plants or enjoying all kinds of activities and experiences with family or neighbors. The keyword 'take', which rose sharply as a new topic word, proved that gardens were used and shared as a place to take pictures. The rise of 'full', 'harmony', 'plant', and 'raise' in the ranking or the positive responses to the type of gardens and flowers such as 'nice', 'pretty', 'beautiful', and 'various' represent news reports and public opinions after visiting a garden, indicating that their interest in various beautiful plants is increasing. In addition, negative topic words such as 'hard', 'hot/cold', or 'not know' proved the needs and complaints about gardens. These negative emotions can be resolved by taking adequate measures such as adding a rest area, creating shades or heating facilities, and installing signs, in addition to performing objective inspections of garden facilities.

Conclusion

To identify the changes in the behavioral patterns and perceptions of Korean citizens about gardens after the enactment of the Garden Act in 2015, this study analyzed keywords related to 'garden' based on data of 2014 and 2018, which are before and after the enactment. The research scope was limited to Naver Blog, Café, and News created in 2014 and 2018, and a total of 289,214 cases (23,389 from Naver News, 41,721 from Naver Café, and 224,104 from Naver Blog) were analyzed using text mining, which is a method of big data analytics.

As a result of big data analysis related to gardens in 2014 and 2018, there were no keywords or information directly related to arboretums on the data, but the amount of buzz increased by approximately 9.4% from 138,127 cases in 2014 to 151,087 cases in 2018. This indicates that policies have been established and supported to promote the garden culture such as hosting various expositions and garden shows and creating all kinds of gardens led by local governments due to the enactment. In fact, the public are participating in various events in many different regions of Korea, visiting nearby gardens to experience diverse forms of gardens, and showing more and more interest in beautiful plants. This is a significant result proving that the public interest in gardens has expanded, and gardens are perceived and popularized as not only a place created within indoor space like home or a café instead of a specific region but also as a flower pot with plants, regarded as a popular, everyday space or activity.

It seems that the interest in and understanding of gardens have also increased regionally, with people encountering festivals and events by the government and local governments on all kinds of media or actually visiting them. These festivals and events include Suncheon Bay National Garden, International Horticulture Goyang Korea, and Ulsan Taehwagang National Garden. Analyzing the patterns of garden use among people today has significance in expanding garden culture. Garden culture has enough potential to become more popular by coexisting with commercial facilities such as restaurants or cafes that offer rest, sights, and food, even though they are not necessarily big. It is also necessary to constantly develop various contents for the behavioral patterns of people enjoying gardens more as a daily space than a public space. There is a need to come up with ideas to increase interest in gardens during summer and winter when the frequency is relatively low.

By using the garden-related 'positive' topic words analyzed in this study (delicious, eat, rest, fun, enjoy, visit, take, full, various) in garden formation, planning, or programs and using 'negative' topic words (hard, hot, cold, not know) in garden maintenance, operation, and management, it would be possible to create a more suitable garden space for the garden usage patterns of people today and provide improved cultural services.

As a result, the diversity of data and the amount of buzz increased significantly from 2014 to 2018, proving the change in public behavior and perception through expanded perception and policy related to the scope of gardens. The usage pattern of modern gardens is changing toward a multifunctional space, from merely tending and decorating to eating food, taking pictures, enjoying, and having fun.

There are limitations in generalizing the results of this study since the research scope is limited to Naver Blog, Café, and News. Therefore, the media must be diversified for a more in-depth analysis of the perception of gardens. The results of analysis have significance in that they have more objectively revealed the change in public perception about gardens in line with the rapidly diffusing garden culture.
in Korea. The results can also be effectively used in organizing various garden projects that meet the needs of visitors, making plans, developing programs, and managing gardens.

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