



# The effect of the opening of the KTX Gyeonggang high-speed railway line in improving perceptions of PyeongChang in Korea leading to sustainable tourism

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## Abstract

High-speed railways improve mobility and enhance accessibility between regions, thereby substantially expanding and promoting social and economic activities. The aim of this study was to examine whether the introduction of the high-speed KTX Gyeonggang Line to support the 2018 PyeongChang Winter Olympics and Paralympics in South Korea had an effect on how tourism to the PyeongChang region is perceived. We extracted tourism-related keywords from social network services and major portal sites used in South Korea, and analysed them for the year before and the year after the opening of the line. The results of the study suggest that there was an initial high interest in the opening of the line and an expectation of a reduction in physical travel time and of an increase in regional development. After the opening of KTX, the results suggest a higher recognition of PyeongChang and the surrounding area as sightseeing destinations. The implications are that the opening of the KTX Gyeonggang Line improved tourism attractiveness and accessibility along with the legacy of the PyeongChang Winter Olympics and that it is considered to be a major factor affecting the sustainable development of tourist attractions in the PyeongChang area and tourists' perception and future behaviour.

**Keywords:** high-speed railway, PyeongChang, Winter Olympics, tourist perceptions, South Korea, big data, social media.

## Introduction

Railways have technically intensive characteristics. Trains are faster than ships, more comfortable than cars, and adhere better to departure schedules than passenger aeroplanes. In addition, it has become an important part of Korea's transportation network, bringing convenience and comfort (Cox, Houdmont, & Griffiths, 2006; Kardas-Cinal, 2009). Korea Train eXpress (KTX Gyeonggang Line) opened the first phase of the Gyeongbu line in 2004, followed by the Honam High-Speed Railway in 2015 and the Gyeonggang High-Speed Railway in 2017 (figure 1 and 2), which now possible to cross the country in half a day. Today, railways have an influence not only on the South Korean economy but also on various other spheres such as society and culture. The improvement of mobility and accessibility between regions means that it plays an important role in practically expanding people's social and economic activities in terms of the efficiency of expanding inter-regional

exchanges (Nutley, 1980; Ning, Tang, Dong, Wen, Liu, Gao, & Wang, 2011).

According to the KORAIL Sustainability Report of 2019, the KTX Gyeonggang Line's cumulative passenger count reached 643 million, with an average of 3,433 train runs and 351.5 million pax/8.5 million tons of traffic per day. KORAIL was selected as the official supplier of the railway service of the 2018 PyeongChang Winter Olympics and Paralympics, held from February to March 2018, and a total of 4,135 train runs during this period, transporting a total of 1,062,000 passengers (Korail, 2019). As such, high-speed railways play a major role in linkages within the tourism industry and creating urban regeneration and tourism revenue through its support for international sports events (Delaplace, Pagliara, Perrin & Mermet, 2014; Guirao & Campa, 2016; Pagliara, Mauriello & Di Martino, 2019).



Figure 1. KTX Gyeonggang Line connects Seoul to Olympic cities (korea.net)



Figure 2. KTX Gyeonggang line links Seoul with Pyeongchang (Hani.co.kr)



In addition, in terms of tourism acceptance, it is regarded as a driving force to maximise the tourism effect of high value-added factors such as accommodation, transportation, food, and shopping, as well as linkage between regions (Rietveld, 2000; Dittmar & Ohland, 2012). Tourists choose tourist destinations by considering various valuable attributes such as a rich experience, entertainment, and the recreational nature of tourist products along with the unique attractions of tourist destinations (Cracolici & Nijkamp, 2009). The economic value and social value of high-speed railways have to be seen in terms of the selection attributes of such tourist destinations, which can change depending on physical distance, psychological distance, and travel time and cost, along with the economic efficiency of the service (Rugg, 1973).

Academic research on the railway industry has been done in a wide variety of disciplines, including the humanities and social sciences, as well as physics, science, and engineering. For the purposes of this study, social science research is focused on strategic utilisation plans or on predicting changes according to the characteristics of a railway line, such as the change in spatial structure when a new railway lines opens (eg. Fengjun & Jiao'e, 2004; Meng & Lu, 2012), the socioeconomic ripple effects (eg. Song, & Na, 2012; Kim, Lee, & Park, 2013), the improvement and operational efficiencies of the traffic system, and the function and role of the railways (eg. Dallen, 2007; Lyons, Jain, & Holley, 2007). However, there is no theoretical and empirical analysis on how the construction of a railway transportation system affects changes in how tourist destinations are perceived and how perceptions change in a different way when people are relatively dependent on a high-speed railway.

Therefore, this study aimed to extract tourism-related keywords from social networking service (SNS) and other major portal sites in PyeongChang, Gangwon-do, to compare and analyse them for the time periods before and after the opening of the KTX Gyeonggang Line, and to suggest the implications of the findings. The research method was to extract related keywords through semantic network analysis, which is a social big data analysis method, and to discuss the implications and future directions related to tourism. Ultimately, this study aimed to understand the changes in the perception of PyeongChang as a tourist destination through big data analysis, and to define the role of a future-oriented and sustainable high-speed railway as well as how local governments can promote sustainable tourism.

## ***Theoretical Background***

### **Perception of Tourist Destinations**

The perception of tourist destinations has been extended from the perception of functional factors such as landscape, climate, and tangible and intangible tourism service factors to the perception of emotional factors such as the image, attractiveness, or familiarity of tourist destinations, which includes urban brands (Tapachai, & Waryszak, 2000; Hosany & Prayag, 2013). Also, psychological factors such as tourism needs or tourism motivation are important variables affecting the perception of sustainable tourist destinations (Um & Crompton, 1990; Awaritefe, 2004). These psychological factors are treated as major selection attributes in the causal relationship that shows how the image of a tourist destination is formed through tourism behaviour and city branding (Vogt & Andereck, 2003). Research on the selection attributes of tourist destinations is being done to ensure that they differentiate themselves by being competitive and by responding to environmental changes (Rio, & Nunes, 2012). Enright and Newton (2004) said that the perception of the attraction of tourist destinations is important not only for tourists' intention to visit but also for the competitiveness of tourist destinations and for the recreation of urban images.



The image of a tourist destination means the sum of people's beliefs, impressions, thoughts, and perceptions about a place or a tourist destination, and it is formed through information acquired by a tourist or through experience (Gartner, 1994; Tasci & Gartner, 2007). The image of a tourist destination is considered to be a leading factor of tourism motivation (Fakeye & Crompton, 1991) and an influential factor that promotes the selection of tourist destinations (Yoon & Uysal, 2005). Goodrich (1997) has divided the attributes that tourists most highly valued when choosing a tourist destination into scenery, attitude of local residents, rest and relaxation, proper accommodation, water sports, golf and tennis, food, shopping facilities, interesting culture, and entertainment. Kim (2014) developed a scale of experience factors that influence tourists to perceive tourist destinations as impressive. The factors were tourism infrastructure, cost-effective value, accessibility, local culture, topography and climate, entertainment, tourism environment management, hospitality, service quality, attractiveness, a variety of activities, and events. Eusébio and Vieira (2013) made an evaluation that tourists' perceptions of tourist destinations were formed by experiences such as the quality of tourist products and the diversity of leisure activities, as well as the tourism management system such as accessibility, attractiveness, accommodation, and restaurants.

These attributes of tourist destination selection are understood to be subject to the individual value systems of tourists and to a subjective cognitive process, which act as motivation for the choice of destinations (Mayo & Jarvis, 1981). Therefore, the perception of tourist destinations can be considered as complementary factors that result from the emotional image of tourist destinations and the organic response of cognitive selection attributes (Beerli & Martin, 2004).

### **Tourist Trends in the PyeongChang Area**

PyeongChang is in the middle of the Taebaek mountain range in the southern part of Gangwon Province, with an average altitude of more than 600 m, and is famous for the 2018 Winter Olympics. The average annual precipitation is lower than that of Gangwon Province and the average temperature in July is 19.1 °C, which is cool. The cultural attractions include 'Sangwonsa Dongjong' and 'Woljeongsa octagonal-shaped stone pagoda', five national treasures, five historical monuments, three natural monuments, one national folk cultural asset, and one registered cultural asset. Other tourist attractions include Hyoseok Culture Village, Lee Seung-bok Memorial Hall, PyeongChang-dong River Fish Ecology Hall, the Daenung Festival, and a ski resort. Although accessibility was not good before the Yeongdong Expressway was opened in 1975, the situation improved after the opening and expansion of the highway. With the construction of the Wonju-Gangneung section of the KTX Gyeonggang Line, PyeongChang Station and Jinbu Station were built in Pyeongchang county (Pyeongchang County, 2019).

PyeongChang's 2018 Winter Olympics has secured it a reputation and image as a representative mega event host city in terms of size and influence. In addition, it has influenced the perception of tourist destinations across a wide range of areas, including economic, social, and cultural (Ritchie & Smith, 1991; Lee, 2016). In particular, tourism demand is expected to increase after the Olympics due to the operation of the KTX Gyeonggang Line. This means that Gangwon-do's tourism is changing from the stopover type of tourism, which mostly involved cars, to the destination type of tourism. Also, as the psychological risk factors of tourist destinations decrease and are converted into positive factors, more diverse alternatives can be encountered (Fuchs & Reichel, 2011).



The tourist attractions and courses of PyeongChang include Odaesan National Park, temples like Woljeong-sa and Sangwon-sa, Hyoseok Cultural Village, which is the setting of the novel 'At the time of the buckwheat blossom', Daegwallyeong Fowl Ranch, which Koreans call the Alps, and Baekryeong Cave, the only exploration cave in Korea. The charm of PyeongChang is attracting attention to the city as a destination for an emotional healing trip that includes nature, history, and culture.

In addition, PyeongChang has expanded its strategic promotion channels by delivering a 'peace' message to tourists through the 'South-North Peace Mood' created after the Winter Olympics and is discovering sustainable themes for tourism in Gangwon Province (Merkel & Kim, 2011; Kang, & Kim, 2019). Korea Tourism Organisation announced the 'PyeongChang Tourism Olympic Roadmap' to revitalise tourism in PyeongChang. It was defined as 'P (Place), O (Olympic), S (Season), T (Transport) Olympics', being the four core tasks of post-Olympics management to create a sustainable Olympic tourism heritage. The main tasks aimed at promoting the venue based on the winter sports infrastructure of PyeongChang. It includes 'Activation of Winter Tourism using Olympic Stadium', 'Attracting a large MICE (Meeting, Incentive tour, Convention, and Event) using the Olympic brand', 'Creating a 4-season tourist destination', and 'Development of Gangwon tourism products linked to Yangyang Airport and the KTX Gyeonggang Line' (Press release by the KTO, Jan, 29, 2018). As such, PyeongChang is trying to find ways to link regional development based on dramatically changed accessibility and stadium facilities and to expand new tourism opportunities.

### **Railway Tourism-Related Research**

Railway tourism is also referred to in research as railway transportation tourism, sightseeing trains, and railway passenger tourism, depending on the nature of the study. In a broad sense, railway tourism means tourist transport, referring to people who travel using railways for the purpose of passenger travel or touring. On the other hand, in the narrower sense, railway tourism includes tourists using railways for tourism purposes to travel to tourist destinations.

The research on railway tourism in a broad sense mainly focuses on analysing the relationship between railway and tourist destinations or analysing the behavioural change of tourists. Railways had a great influence on the formation and development of tourist attractions (Mammadov, 2012; Lee & Chen, 2017). Especially, the advent of railways has made mass tourist travel and long-distance overland travel popular. The development of local tourist attractions and the commercialisation of tourism resources have followed suit as a logical economical consequence (Eccles, 1995).

Recently, as high-speed railways to traffic-vulnerable areas such as Jeolla-do and Gangwon-do have been opened, there have been concerns about strategic marketing perspectives creating a welcoming attitude, developing tourist routes, and attracting tourists. Shim (2017) emphasised that, taking Jecheon as an example, the opening of Jecheon's railway not only improved the efficiency of domestic cargo transportation but also laid the foundation for developing it as a comprehensive tourist destination for healing and water sports themes centred on Cheongpung Lakeside.

In particular, 'O-train', a central inland circular train route connecting neighbouring small and medium-sized cities such as Yeongwol, Taebaek, Yeongju, and Danyang, helped these cities to form a common vitality and achieve tourism synergy effects. Regarding the opening of the Gyeonggang High-Speed Railway, the Korea Maritime Affairs and Fisheries



Development Institute (2018) proposed improvement plans for the acceptance of tourism in Gangwon area and activation plans for marine tourism. Kim (2018) found that the high-speed railway supported the successful hosting of the Winter Olympics and then contributed greatly to the creation of a clean and healing image, the connection and promotion of comfortable and convenient residential space, and the activation of mountain tourism.

Su and Wall (2009) reported that the opening of the Qinghai-Tibetan Railway in July 2006 greatly improved the accessibility and price competitiveness of Tibetan travel, the railway acted as a major factor when tourists selected Tibet as a final tourist destination. Dallen (2007) emphasised that railways are a major factor in selecting tourist destinations in that they are a sustainable means of transportation that reduces the traffic congestion and carbon dioxide emissions that cars cause, develops traffic between tourism and leisure markets, and expands the range of tourism activities.

Research on railway tourism in the narrow sense is mainly done from a marketing point of view, such as the development and operation of railway travel products and services, and the attraction of tourists (Keeling, 2008; Roy & Hannam, 2013). Railway tourism also means transporting tourists to destinations in trains with tourist themes. Railway tourism, therefore, itself is a tourist attraction and is composed of packaged products in connection with tourist attractions or surrounding tourism or traffic services. As a railway tourism product in Gangwon Province, a seaside train is operated between Gangneung and Samcheok, using the seaside Samcheok Line, and the Jeongseon Arirang Train is operated to absorb the tourism demand of the Jeongseon Line and to return from Cheongryangri to Auraji. Larsen (2001) described train tourism as one of the cultural tourism behaviours where people can freely imagine metaphorical experiences such as those found in movies and enjoy physical and emotional experiences from a visual perspective that is moving, unlike the static space of appreciating photographs and artworks, for instance. Lyons, Jain, and Holley (2007) recognised that travel time, which can be considered as unproductive time, can be converted into a valuable time with positive utility when using the railway. Noor, Nair, and Mura (2014) defined the railway as a means of moving away from the modern city in trains that return quickly and of feeling the charm of slow tourism, and emphasised that the railway is a means of developing rural tourism destinations as a sustainable tourist destination without requiring much investment.

## **Materials and Methods**

### **Research Questions**

This study was conducted to compare the perception of PyeongChang tourism before and after the opening of the KTX Gyeonggang Line, using social media big data. This was done by applying semantic network analysis, a social media big data analysis method, to keywords extracted from major portal sites dating from one year before and one year after the opening of the KTX Gyeonggang Line. In order to carry out the research in detail, it was divided into three research questions:

Research Question 1: What are the key words related to Pyeongchang tourism in Gangwon-do before and after the opening of the KTX Gyeonggang Line?

Research Question 2: What are the differences between the centrality and cluster of core words related to Pyeongchang tourism in Gangwon-do before and after the opening of the KTX Gyeonggang Line?



Research Question 3: What are the suggestions for the revitalisation of sustainable Tourism through the analysis of the differences before and after the opening of the KTX Gyeonggang Line?

### **Analysis Objects and Data Collection**

Based on the opening of the KTX Gyeonggang Line, the analysis period for this study was set by using the year from 1 December 2016 to 30 November 2017, before the opening of the KTX Gyeonggang Line, and the year from 1 December 2017 to 30 November 2018, after the opening of the KTX Gyeonggang Line.

The social media used in the analysis were the chat rooms and blogs of Naver, and Daum, familiar portal site in Korea, and finally Facebook. The above three portal sites are widely used in Korea and abroad, and they are judged to be suitable for comparative research on the perception of PyeongChang tourism. For the analysis of social media big data, the data collection and selection process for key keywords were conducted first. The key core word was selected as 'KTX PyeongChang Tourism' for analysis.

### **Analysis Procedures and Methods**

The analysis was carried out in four steps. The first step is selecting keywords, as described above. The second step is collecting accompanying terminology related to the key keyword 'KTX PyeongChang Tourism'. We used the text mining program KrKwic and TEXTOM to collect the simultaneous keywords related to 'KTX PyeongChang Tourism'. Keywords that had a low correlation with 'KTX PyeongChang Tourism' as well as Korean connectives and postpositions were deleted. Through this process, 50 keywords that are clearly related were extracted.

In the third step, a matrix of the 50 keywords was constructed in which the frequency and weight of the keywords were summarised, using the KrTitle program. The matrix was constructed around nouns and used the one-mode matrix method consisting of 'word x words'. In the fourth and last step, the UCINET6 program was applied to analyse centrality, the semantic network, and CONCOR (Convergent Correlation) for the matrix. The visualisation work was done by using the Netdraw program included in the UCINET6 program.

### **Results**

A total of 2,579 keywords related to 'KTX PyeongChang Tourism' from 1 December 2016 to 30 November 2017 were collected. A total of 319 keywords were collected from Naver cafe, 1,000 keywords from Naver blogs, 414 keywords from the Daum cafes, 835 keywords from Daum blogs, and 1 keyword from Facebook. A total of 2,720 keywords related to 'KTX PyeongChang Tourism' from 1 December 2017 to 30 November 2018 were collected. A total of 518 keywords were collected from Naver cafe, 1,000 keywords from Naver blogs, 398 keywords from the Daum cafes, 797 keywords from Daum blogs, and 7 keywords from Google Facebook.

### **Analysis of PyeongChang Tourism**

The 50 keywords are summarised and described in Table 1 Results of analysis of keywords related to PyeongChang tourism, which follows on page 8.

Before the opening of the KTX Gyeonggang Line			After the opening of the KTX Gyeonggang Line		
Keyword	Frequency	Percentage	Keyword	Frequency	Percentage
Seoul	970	1.968	Distance	969	1.849
Gangneung city	953	1.933	Gangneung city	800	1.527
Opening	666	1.351	Seoul	670	1.278
Gangwon Province	523	1.061	Building	519	.990
Olympics	281	.570	Olympics	415	.792
wonju city	254	.515	Gangwon Province	409	.780
Incheon airport	244	.495	Opening	351	.670
Development	240	.486	Pyeongchang	337	.643
Hosting	226	.458	Use	309	.589
Real estate	223	.452	KTX Gyeonggang Line	265	.505
Hotel	215	.436	Travel	243	.463
Investment	180	.365	Region	226	.431
Ramada Hotel	177	.359	Ski resort	213	.406
To be scheduled	171	.346	location	205	.391
Special	152	.308	Gyeonggang KTX	200	.381
the capital	136	.275	Golf	187	.356
December	133	.269	nerby	176	.335
Sokcho city	131	.265	Pyeongchang IC	175	.334
use	131	.265	Environment	165	.314
Chuncheon city	129	.261	Period	164	.313
express highway	128	.259	Bus	162	.309
Travel	128	.259	Mt. Geumdang	154	.293
Traffic	126	.255	site	153	.292
Accessibility	120	.243	Pension	139	.265
Region	119	.241	Festival	138	.263
Sale	116	.235	Yongpyong County	128	.244
Plan	112	.227	Opening	127	.242
expectation	109	.221	Jangpyeong County	126	.240
favorable factor	107	.217	Seoul station	124	.236
Place	105	.213	Hotel	124	.236
Distance	104	.211	Valley	120	.229
Gyeonggang Line	102	.206	Watching	120	.229
next year	102	.206	Gyeonggang Line	116	.221



Land	102	.206	plan	114	.217
Suite	99	.200	View	113	.215
Gangneung	97	.196	Korea Tourism Org.	112	.213
Jinbu station	96	.194	Ramada Hotel	111	.211
bid	96	.194	Convenience	111	.211
Tourist	96	.194	Herb Country	111	.211
Inchon	95	.192	Goodwill	111	.211
Railway	95	.192	express highway	110	.209
ticket	93	.188	Jinbu station	109	.208
Yangyang city	90	.182	game	109	.208
This year	88	.178	Move	104	.198
Nationwide	87	.176	Operation	102	.194
Operation	85	.172	footpath	101	.192
Stadium	83	.168	Wonju city	99	.188
Territory	83	.168	Inchoen airport	97	.185
Arrival	82	.166	stream	97	.185
Tourism	81	.164	Cheongnyangni station	96	.183

Seoul (970) is the keyword that had the highest frequency before the opening of the KTX Gyeonggang Line. The use of the word is judged to have been the result of the KTX Gyeonggang Line as it is the departure point from the area where most tourists visiting PyeongChang usually stay. Other keywords that showed high frequency were 'Gangneung city (953)', 'Opening (666)', 'Gangwon province (523)', 'Olympics (281)', 'Wonju city (254)', 'Incheon Airport (244)', 'Development (240)', 'Real Estate (223)', 'Hotel (215)', 'Investment (180)', 'Ramada PyeongChang Hotel (177)', 'To be scheduled (171)', 'Special (154)', 'The capital (136)'. The keyword that showed the highest frequency after the opening the KTX Gyeonggang Line is 'Distance (969)'. This is judged to refer to a psychologically short travelling distance when going from Seoul and other metropolitan areas to Pyeongchang and Gangneung after the opening of the KTX Gyeonggang Line. It is judged that these areas are reflected in the perception of tourists. Next, the keywords that appeared in the same time showed high frequency were 'Gangneung city (800)', 'Seoul (670)', 'Building (519)', 'Olympics (415)', 'Gangwon province (409)', 'Opening (351)', 'Pyeongchang (337)', 'Use (309)', 'KTX Gyeonggang Line (265)'.

The results of the analysis of the degree centrality of the keywords showed that before the opening of the KTX Gyeonggang Line, the main keywords were 'Gangneung city (.166)', 'Seoul (.090)', 'Olympics (.077)', 'Opening (.074)', 'Hotel (.070)', 'Gangwon province (.063)', 'Wonju city (.056)', 'Sale (.056)', and 'Investment (.055)'. After the opening of the KTX Gyeonggang Line, the main keywords were 'PyeongChang (.088)', 'Olympics (.042)', 'Gangneung city (.041)', 'Travel (.023)', 'Seoul (.019)', and 'KTX Gyeonggang Line (.017)'.



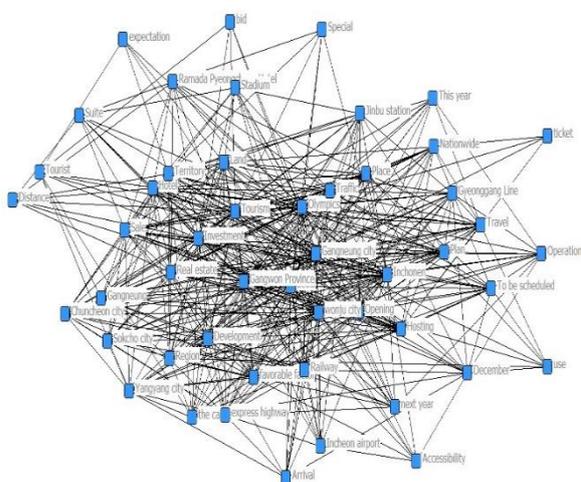
The results of the closeness keyword analysis before the opening of the KTX Gyeonggang Line highlighted the following: 'Gangneung city (92.45)', 'Olympics (89.09)', 'Seoul (85.96)', 'Wonju city (79.03)', 'Tourism (79.03)', 'Gangwon province (77.77)', 'Investment (77.77)', 'Opening (76.56)', 'Real Estate (71.04)', 'Hotel (68.05)', 'Sale (67.12)', 'Territory (67.12)', and 'Land (67.12)'. After the opening of the KTX Gyeonggang Line, the results highlighted 'PyeongChang (98.00)', 'Gangwon province (81.66)', 'Olympics (80.32)', 'Gangneung city (74.24)', 'Travel (73.13)', 'Seoul (68.05)', 'Wonju city (68.05)', 'KTX Gyeonggang Line (63.63)', 'Gangneung Station (62.82)', 'Opening (61.25)', 'Hosting (60.94)', 'Bus (60.49)'. The results of the degree of centrality and and closeness before and after the opening of the KTX Gyeonggang Line are summarised in Table 2. In addition, the visualisation of the semantic network analysis of the degrees of centrality and closeness before and after the opening of the KTX Gyeonggang Line are shown in Figure 3 and Figure 4.

**Table 2:** Results of centrality analysis related to PyeongChang tourism.

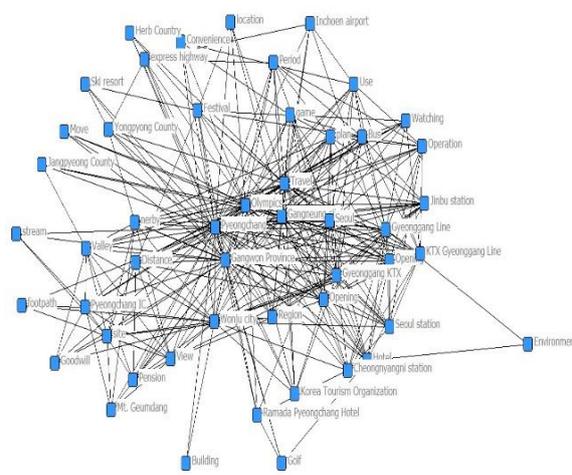
Before the opening of the KTX Gyeonggang Line			After the opening of the KTX Gyeonggang Line		
Keyword	Degree	Closeness	Keyword	Degree	Closeness
Seoul	.090	85.965	Distance	.002	56.322
Gangneung City	.166	92.453	Gangneung city	.041	74.242
Opening	.074	76.563	Seoul	.019	68.056
Gangwon Province	.063	77.778	Building	.000	50.515
Olympics	.077	89.091	Olympics	.042	80.328
Wonju city	.056	79.032	Gangwon Province	.014	81.667
Incheon airport	.011	56.977	Opening	.010	61.250
Development	.022	67.123	Pyeongchang	.088	98.000
Host	.008	64.474	Use	.005	59.977
Real estate	.028	71.014	KTX Gyeonggang Line	.011	61.250
Hotel	.074	68.056	Travel	.023	73.134
Investment	.055	77.778	Region	.001	58.333
Ramada Hotel	.033	56.977	Ski resort	.000	51.579
To be scheduled	.007	59.756	location	.000	52.128
Special	.001	52.688	Gangneung station	.009	62.821
the capital	.014	59.756	Golf	.000	52.128
December	.017	58.333	nerby	.001	56.977
Sokcho city	.012	61.250	Pyeongchang IC	.010	56.322
use	.001	52.128	Environment	.000	40.164



Chuncheon city	.007	59.756	Period	.001	55.056
express highway	.027	63.636	Bus	.004	60.494
Travel	.018	60.494	Mt. Geumdang	.001	53.261
Traffic	.016	72.059	site	.001	56.977
Accessibility	.002	53.846	Pension	.001	54.444
Region	.010	65.333	Festival	.003	56.322
Sale	.056	67.123	Yongpyong County	.001	53.261
Plan	.007	59.756	Opening	.004	60.494
expectation	.002	51.579	Jangpyeong County	.000	51.579
favorable factor	.013	65.333	Seoul station	.002	57.647
Place	.010	64.474	Hotel	.010	58.333
Distance	.001	53.261	Valley	.002	56.322
Gyeonggang Line	.025	61.250	Watching	.002	55.682
next year	.006	57.647	Gyeonggang Line	.017	63.636
Land	.023	67.123	plan	.002	59.756
Suite	.015	55.682	View	.007	57.647
Gangneung	.014	62.025	Korea Tourism Org.	.001	53.846
Jinbu station	.007	59.756	Ramada Hotel	.006	53.261
bid	.003	52.688	Convenience	.003	52.128
Tourist	.004	55.056	Herb Country	.000	51.579
Inchonon	.021	70.000	Goodwill	.003	52.688
Railway	.027	69.014	express highway	.002	52.688
ticket	.006	51.042	Jinbu station	.001	57.647
Yangyang city	.037	61.250	game	.003	58.333
This year	.009	55.682	Move	.000	51.579
Nationwide	.008	59.756	Operation	.002	56.977
Operation	.009	56.977	footpath	.005	51.579
Stadium	.006	58.333	Wonju city	.005	68.056
Territory	.034	67.123	Inchoen airport	.000	52.688
Arrival	.022	55.682	stream	.008	51.579
Tourism	.029	79.032	Cheongnyangni station	.001	55.582



**Figure 3.** Visualization result before opening the KTX Gyeonggang Line



**Figure 4.** Visualization result after opening the KTX Gyeonggang Line

### The Results of the CONCOR Analysis

In this study, a CONCOR analysis was conducted to compare and analyse the change in the perception of PyeongChang tourism before and after the opening of the KTX Gyeonggang Line by using social media big data. CONCOR analysis is a methodology to identify the correlation-based connection pattern between core words, to form blocks based on them, to cluster core words, and to give meaning to them (Scott, 1988). As a result of our CONCOR analysis two central clusters and two surrounding clusters were formed for each of keywords from before and after the opening of the KTX Gyeonggang Line. Before the opening of the KTX Gyeonggang Line, one central cluster was formed of keywords such as real estate, next year, traffic, Olympics, expectation, Jinbu Station, land, tourists, holding, metropolitan area, region, land, goodwill, and development, and was named 'Olympic Regional Development'. The second central cluster consisted of Gangneung City, Incheon, Gyeonggi Province, Accessibility, Use, Gangneung, This year, KTX Gyeonggang Line, Operation, Opening, Arrival, Highway, Planning, and Railway, and was called 'Expansion of Traffic Infrastructure'.

The first surrounding cluster consisted of the keywords suites, streets, fountains, hotels, and specials, and was called 'Hotel Development. The second surrounding cluster consisted of the keywords Chuncheon city, Sokcho city, and Investment, and was called 'Near-Investment'. The clusters after the opening of the KTX Gyeonggang Line were as follows: The first central cluster consisted of the keywords Gangwon-do, street, Olympic, Jangpyeong county, Highway, Region, Use, Hosting, Korea Tourism Organisation, Convenience, Festival, Travel, Movement, Jinbu station, Incheon airport, and Viewing, and was called 'Olympic traffic expansion'.

The second main cluster consisted of keywords such as Golf, Shill stream, View, Ski resort, Site, Hotel, Herb, country, and Pension, and was called 'Nearby accommodation and sightseeing spot'. The first surrounding cluster contained the keywords KTX Gyeonggang Line, Kyunggang Line, Seoul Station, Operation, Wonju, Cheongryangri Station, and





a high degree of centrality and closeness. Since the 2018 PyeongChang Winter Olympics, the KTX Gyeonggang Line has been recognised and actively used by tourists. Tourists were considering the use of KTX from the Seoul metropolitan area, and they visited the Winter Olympics. Even after the Winter Olympics closed, they are believed to have travelled to PyeongChang area along with various linked transportation methods.

The academic and practical implications of this study are as follows: First, research on railway tourism in the past has focused on causality or change of tourist behaviour between railway and tourist destinations, and narrowly, the research focused on marketing methods such as railway travel products, service development and operation, and tourist attraction. However, based on SNS, which is used by tourists for sharing various opinions, this study examined the awareness of PyeongChang tourism before and after the opening of the KTX Gyeonggang Line.

Therefore, it can be used as basic data for the expansion of infrastructure and revitalisation of tourism in the future, and it will be helpful for constructing a sustainable tourism roadmap through identifying the awareness of tourists. Second, as a result of the centrality analysis, it was confirmed that the connectivity of the same or similar keywords was somewhat lower after the opening of the KTX Gyeonggang Line than in the previous year. The reason for this is that information and interest in the Gyeonggang Line KTX was concentrated with the 2018 PyeongChang Winter Olympic Games, and after the event had ended, information sharing about PyeongChang tourism was somewhat reduced. In order to revitalise sustainable PyeongChang tourism through the KTX Gyeonggang Line, it is necessary to hold continuous online events through SNS and strengthen online marketing by using major tourism related influencers. Especially, when selling tourism package products related to the KTX Gyeonggang Line, it is necessary to promote and advertise online rather than offline. In addition, SNS marketing can continuously use various kinds of content, regardless of the specific time, and tourists themselves can share information on various kinds of PyeongChang tourism and recreate it by recommending it positively to other potential tourists. Third, the clusters derived from the CONCOR analysis results confirmed that the number of central and surrounding clusters before and after the opening of the KTX Gyeonggang Line was similar. However, if you look at the keywords included in the central clusters, those in the post-opening clusters are different.

Before the opening, there was a lot of interest in regional development and transportation infrastructure expansion through the Winter Olympics. After the opening, the transportation infrastructure expanded after the Winter Olympics and the surrounding accommodation and tourist attractions were confirmed. In addition, there was a lot of interest in regional investment and the hotel development in the surrounding clusters before opening of the railway line. The KTX Gyeonggang Line is expected to improve accessibility from the metropolitan area to the Pyeongchang area through the opening of the Gyeonggang Line, and high interest and investment in hotel development seems to have been reviewed.

After opening, it was confirmed that there was a lot of interest in information about the operation and use of the KTX Gyeonggang Line. It seemed to be checking the operation information and usage information in advance to enjoy sightseeing in Pyeongchang area and Gangneung area using KTX Gyeonggang Line. In the end, it is judged that the opening of the KTX Gyeonggang Line helped to develop the region through the PyeongChang Winter Olympics. It is important to understand the flow of the awareness of tourists for domestic investment by KTX in the future. If various marketing and operation strategies are established based on the perception flow of tourists in KTX investment and development, it will be an important factor for sustainable tourism.



This study's limitations and our recommendations for future research are as follows: The study was conducted using online SNS and portal sites. It is expected that the study will be more robust if qualitative research or awareness-related survey research through related expert interviews is conducted in parallel. There was no means of telling what proportion of the keywords was generated by tourists and the possible confounding effect of the Winter Olympics itself has not been accounted for in the study.

## References

- Awaritefe, O. (2004). Motivation and other considerations in tourist destination choice: A case study of Nigeria. *Tourism Geographies*, 6(3), 303-330.
- Beerli, A. & Martin, J. D. (2004). Factors influencing destination image. *Annals of tourism research*, 31(3), 657-681.
- Cox, T., Houdmont, J. & Griffiths, A. (2006). Rail passenger crowding, stress, health and safety in Britain. *Transportation Research Part A: Policy and Practice*, 40(3), 244-258.
- Cracolici, M. F. & Nijkamp, P. (2009). The attractiveness and competitiveness of tourist destinations: A study of Southern Italian regions. *Tourism management*, 30(3), 336-344.
- Dallen, J. (2007). The challenges of diverse visitor perceptions: rail policy and sustainable transport at the resort destination. *Journal of Transport Geography*, 15(2), 104-115.
- Dallen, J. (2007). Sustainable transport, market segmentation and tourism: The Looe Valley branch line railway, Cornwall, UK. *Journal of Sustainable Tourism*, 15(2), 180-199.
- Delaplace, M., Pagliara, F., Perrin, J. & Mermet, S. (2014). Can High Speed Rail foster the choice of destination for tourism purpose? *Procedia-Social and Behavioral Sciences*, 111, 166-175.
- Dittmar, H. & Ohland, G. (Eds.). (2012). *The new transit town: best practices in transit-oriented development*. Island Press.
- Eccles, G. (1995). Marketing, sustainable development and international tourism. *International Journal of Contemporary Hospitality Management*, 7(7), 20-26.
- Enright, M. J. & Newton, J. (2004). Tourism destination competitiveness: a quantitative approach. *Tourism management*, 25(6), 777-788.
- Eusébio, C. & Vieira, A. L. (2013). Destination attributes' evaluation, satisfaction and behavioural intentions: A structural modelling approach. *International Journal of Tourism Research*, 15(1), 66-80.
- Fakeye, P. C. & Crompton, J. L. (1991). Image differences between prospective, first-time, and repeat visitors to the Lower Rio Grande Valley. *Journal of travel research*, 30(2), 10-16.
- Fengjun, J. I. N. & Jiao'e, W. A. N. G. (2004). Railway Network Expansion and Spatial Accessibility Analysis in China: 1906~ 2000 [J]. *Acta Geographica Sinica*, 2.



Fuchs, G. & Reichel, A. (2011). An exploratory inquiry into destination risk perceptions and risk reduction strategies of first time vs. repeat visitors to a highly volatile destination. *Tourism Management*, 32(2), 266-276.

Gartner, W. C. (1994). Image formation process. *Journal of travel & tourism marketing*, 2(2-3), 191-216.

Goodrich, J. N. (1997). Book Reviews: CULTURAL TOURISM IN EUROPE edited by Greg Richards (CAB International, Wallingford, UK, 1996, 347 pages). *Journal of Travel Research*, 35(3), 91-91.

Guirao, B., & Campa, J. L. (2016). Cross effects between high speed rail lines and tourism: Looking for empirical evidence using the Spanish case study. *Transportation Research Procedia*, 14, 392-401.

Hosany, S. & Prayag, G. (2013). Patterns of tourists' emotional responses, satisfaction, and intention to recommend. *Journal of Business Research*, 66(6), 730-737.

Scott, J. (1988). Social network analysis. *Sociology*, 22(1), 109-127.

Kang, M. & Kim, H. (2019). Global and Local Intersection of the 2018 PyeongChang Winter Olympics. *International Journal of Japanese Sociology*, 28(1), 110-127.

Kardas-Cinal, E. (2009). Comparative study of running safety and ride comfort of railway vehicle. *Coordinates*, 1(2), 27.

Keeling, D. J. (2008). Transportation geography—new regional mobilities. *Progress in Human Geography*, 32(2), 275-283.

Kim, H. W., Lee, D. H. & Park, H. S. (2013). The impact of Gyeongbu High Speed Rail construction on regional economic growth. *KSCE Journal of Civil Engineering*, 17(6), 1206-1212.

Kim, J. H. (2014). The antecedents of memorable tourism experiences: The development of a scale to measure the destination attributes associated with memorable experiences. *Tourism management*, 44, 34-45.

Kim, J. J. (2018). The Opening of KTX Gyeonggang Line and the Direction of Development in Gangwon Province. *Public Policy in Korea*, 148, 65-67.

Korail (2019). Korail Sustainable Management Report.

Korea Marine Institute (2018). A Study on Improvement Plans of Marine Tourism following the opening of Seoul-Gangneung KTX, 2018-09.

Korea Tourism Organization (2018). Press release, 29th. Jan. 2018. by Korea Tourism Organization.

Larsen, J. (2001). Tourism mobilities and the travel glance: experiences of being on the move. *Scandinavian Journal of Hospitality and Tourism*, 1(2), 80-98.

Lee, C. F. & Chen, K. Y. (2017). Exploring factors determining the attractiveness of railway



tourism. *Journal of Travel & Tourism Marketing*, 34(4), 461-474.

Lee, J.W. (2016). A game for the global north: the 2018 Winter Olympic Games in Pyeongchang and South Korean cultural politics. *The international journal of the history of sport*, 33(12), 1411-1426.

Lyons, G., Jain, J. & Holley, D. (2007). The use of travel time by rail passengers in Great Britain. *Transportation Research Part A: Policy and Practice*, 41(1), 107-120.

Mammadov, R. (2012). The importance of transportation in tourism sector. In *7th Silk Road International Conference "Challenges and opportunities of sustainable economic development in Eurasian countries", May, 2012 in Tbilisi – Batumi, Georgia*.

Mayo, E. J. & Jarvis, L. P. (1981). *The psychology of leisure travel. Effective marketing and selling of travel services*. CBI Publishing Company, Inc..

Meng, D. Y. & Lu, Y. Q. (2012). Analysis of inter-provincial accessibility and economic linkage spatial pattern based on the railway network. *Geographical Research*, 31(1), 107-122.

Merkel, U. & Kim, M. (2011). Third time lucky!? PyeongChang's bid to host the 2018 Winter Olympics—politics, policy and practice. *The International Journal of the History of Sport*, 28(16), 2365-2383.

Ning, B., Tang, T., Dong, H., Wen, D., Liu, D., Gao, S. & Wang, J. (2011). An introduction to parallel control and management for high-speed railway systems. *IEEE Transactions on Intelligent Transportation Systems*, 12(4), 1473-1483.

Noor, F. A. M., Nair, V. & Mura, P. (2014). Rail travel: Conceptualizing a study on slow tourism approaches in sustaining rural development. In *SHS Web of Conferences (Vol. 12, p. 01058)*. EDP Sciences.

Nutley, S. D. (1980). Accessibility, mobility and transport-related welfare: the case of rural Wales. *Geoforum*, 11(4), 335-352.

Pagliara, F., Mauriello, F. & Di Martino, S. (2019). An analysis of the link between high speed transport and tourists' behaviour. *Turizam: međunarodni znanstveno-stručni časopis*, 67(2), 116-125.

Rietveld, P. (2000). The accessibility of railway stations: the role of the bicycle in The Netherlands. *Transportation Research Part D: Transport and Environment*, 5(1), 71-75.

Rio, D. & Nunes, L. M. (2012). Monitoring and evaluation tool for tourism destinations. *Tourism Management Perspectives*, 4, 64-66.

Ritchie, J. B. & Smith, B. H. (1991). The impact of a mega-event on host region awareness: A longitudinal study. *Journal of travel research*, 30(1), 3-10.

Roy, S. & Hannam, K. (2013). Embodying the mobilities of the Darjeeling Himalayan Railway. *Mobilities*, 8(4), 580-594.

Rugg, D. (1973). The choice of journey destination: A theoretical and empirical analysis. *The*



review of economics and statistics, 64-72.

Shim, S. H. (2017). Gate to Gangwon-do, Jecheon, the center of railway traffic, *Planning and Policy in Korea*, 433, 65-74.

Song, J.Y. & Na, H. S. (2012). A study on the intercontinental transportation competitiveness enhancement plan between Northeast Asia and Europe using the Trans-Siberian railway. *International Journal of Engineering and Technology*, 4(2), 208-212.

Su, M.M. & Wall, G. (2009). The Qinghai–Tibet railway and Tibetan tourism: travelers' perspectives. *Tourism Management*, 30(5), 650-657.

Tapachai, N. & Waryszak, R. (2000). An examination of the role of beneficial image in tourist destination selection. *Journal of travel research*, 39(1), 37-44.

Tasci, A.D. & Gartner, W. C. (2007). Destination image and its functional relationships. *Journal of travel research*, 45(4), 413-425.

Um, S. & Crompton, J. L. (1990). Attitude determinants in tourism destination choice. *Annals of tourism research*, 17(3), 432-448.

Vogt, C. A. & Andereck, K. L. (2003). Destination perceptions across a vacation. *Journal of Travel Research*, 41(4), 348-354.

Yoon, Y. & Uysal, M. (2005). An examination of the effects of motivation and satisfaction on destination loyalty: a structural model. *Tourism management*, 26(1), 45-56.

Korea Meteorological Administration, <http://www.kma.go.kr>

Pyeongchang County Office Home Page, <http://www.happy700.or.kr>