Original Article

Analysis of basic information and reviews of ski resorts:
A comparison between Japanese and foreigners

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Abstract
Following COVID-19, Japan's foreign tourists increased, surpassing 25 million in FY 2023. Popular activities include skiing, pottery, and tea ceremonies. The Japanese government launched "the Project to Promote the Formation of Snow Resorts with High International Competitiveness" in 2020 to boost long-term stays and spending. This study analyses data on 16 ski resorts in the Project and examines ski resort word of mouth (WOM) and data, categorizing by country (Japan, China, and Europe), and before and after COVID-19. It uses principal component analysis to typify WOM, comparing results with basic ski resort data to provide guidelines for future development. WOM trends differ for Japanese but not Europeans pre/post-COVID. Ski resort development impacts WOM, influenced by European cultural backgrounds. The effects vary by country, with high skiing costs. Development is an effective public investment, enhancing inbound tourism and providing economic benefits.

Keywords
ski resort, word of mouth, text mining analysis, principal component analysis, comparison analysis

1. Introduction

With COVID-19 settling down, foreign tourists in Japan are increasing. In FY 2023, the number exceeded 25 million and is expected to increase further in FY 2024 [Ministry of Justice, 2024]. Japan's popular tourist attractions include the ancient capitals of Kyoto and Nara [Hallett, 2024]. Pottery and tea ceremonies are also popular activities. Skiing and snowboarding have recently become popular with Chinese and Australian tourists [Shomaker, 2023]. The Japanese government has also noted high unit consumption costs associated with them, which has a significant economic impact [Takamori, 2023]. The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) implemented the "Project to Promote the Formation of Snow Resorts with High International Competitiveness" (hereinafter referred to as the "Project") in 2020 to increase long-term stays and consumption by foreign visitors to Japan [Japan Tourism Agency, 2020]. The Project subsidizes efforts to realize an integrated formation plan designed by local stakeholders. Fifty percent of the budget for the "development of ski resort infrastructure," "introduction of snow escalators," "renovation and removal of rest houses," and "securing instructors who can handle foreign nationals" is subsidized.

Therefore, this study analyses the basic information, such as the number of visitors and lifts, as well as word-of-mouth data (WOM) on 16 ski resorts participating in the Project. Regarding WOM, it may sometimes refer to the distinction from e-WOM (electronic WOM). In this study, WOM is defined as information obtained from the Internet.

2. Previous research

There are many WOM researches on various subjects including a travel websites [Cantallops and Salvi, 2014; Abubakar and Ilkan, 2016; Vu et al., 2019; Nakamura and Oomiya, 2021; Nakamura and Oomiya, 2020; Nakamura and Oomiya, 2020b; Li and Liu, 2023; Chopra et al., 2024; Kuo, 2024], beauty salons [Ryu and Yang, 2023; Nakamura and Oomiya, 2023; Lee and Jin, 2023; Wahyuni et al., 2024; Hong and Jin, 2023], and e-commerce (EC) sites [Ahn and Park, 2024; Alnoor et al., 2024; Aravindan et al., 2023; Corbos et al., 2023; Oktafiyanti et al., 2024].

This research focuses solely on matters related to ski resorts. Firstly, one study focuses on service quality [Konstantinidis et al., 2018]. Barlas et al. [2010] analyse how ski resort service quality predicts WOM communication. 129 visitors completed a service quality scale, measuring interaction quality, physical environment quality, and outcome quality. Results showed these dimensions significantly predicted WOM communication and ski resort managers should focus on providing personalized services and a friendly atmosphere to enhance WOM promotion. Matzler et al. [2019] investigates price effects on WOM for ski resort visitors. Using hierarchical linear modelling, it finds that price negatively affects WOM for first-time visitors but not for repeat visitors.

Secondly, WOM analyses using morphological analysis to discover new insights. Shang et al. [2022] explores skiers' experiences in ski resorts, highlighting seasonal differences. Using content from 14 ski resorts and sentiment analysis, it reveals that peak season concerns differ from off-season, with non-skiing attributes emphasized off-peak. Zhou and Zhang [2024] examines how ski resorts' ESG performance influences brand equity and subsequently brand love and respect. Surveying 390 respondents are given the significant positive correlation between ESG performance and brand equity. Peng [2022]

presents a text mining framework for destination image (DI) research using UGC, LDA, and sentiment analysis. Tourist sentiment has improved over seven seasons.

Thirdly, the research focuses on customer satisfaction through marketing analysis [Priporas et al., 2012; Şen et al., 2024]. Bonnefoy-Claudet and Ghantous [2013] explores how emotions like joy, excitement, and peacefulness affect customer satisfaction at a French Alps ski resort. Using descriptive statistics and structural equation modelling, it finds these emotions crucial, while "surprise" has no significant impact. Cristobal-Fransi et al. [2018] examines the impact of climate change on ski tourism in southern Europe. It analyses ski resort websites in France and Spain for effective marketing, e-commerce adaptation, and climate change responses. Results indicate the need for improved communication and interaction with the public.

Finally, the ski resort booking system is examined in relation to WOM. Gellerstedt and Arvemo [2019] examines the impact of online reviews versus a good friend's opinion on booking intentions. Results show that a good friend's recommendation can outweigh the majority's online reviews. Yuanxiang et al. [2022] analyses 7118 online reviews to understand beginner skiers' experiences in China's main ski resorts. It identifies five key dimensions affecting experiences: interaction, price, reputation, risk, and functionality. Bausch and Unseld [2018] examines winter sports tourism and its economic impact, focusing on German travellers' winter holiday preferences. Findings reveal that grey winter weather drives the desire to escape, and non-skiers seek snow-covered landscapes and relaxation.

Summarizing the above, there are no studies on ski resort review analysis that include country comparisons or year-over-year comparisons. Additionally, there is no approach that examines the relationship between WOM and basic ski resort data. As a result, we have to study the following approach.

3. The research questions and its flow

Accordingly, WOM trends before and after 2020, when COVID-19 occurred, are analyzed between countries.

This study aims to address the following research questions (RQs).

- RQ1: Do WOM trends differ before and after the onset of COVID-19 in 2020 between countries?
- RQ2: Does WOM change due to the development of ski resorts?

To address the RQs above, this study will be analyzed using the framework in Figure 1 and following the steps below:

1. Collect WOM of ski resorts from Google Maps, Asoview, and Jalan and ski resorts' basic information, such as the "number of lifts," "number of visitors," and "web page descriptions" from web pages from the pre-COVID period (January 2008-December 2019) and the post-COVID period (January 2020-July 2024) during the period from May to July 2024. Scraping is performed using Python, and analysis is conducted with Exploratory (2024).
2. Categorize the WOM by country (Japan, China, and Europe) and before and after the onset of COVID-19 in 2020. WOM and the "web page descriptions" of the resorts were analyzed morphologically. Then, principal component analysis (PCA) is performed to typify the WOM.
3. Compare and analyze the results with the ski resorts' basic information.

This study expects to provide a guideline for future ski resort development.

4. Basic information and data analysis

4.1 Basic information of ski resort and word of mouth

First, the 16 ski resorts were selected from the Project in 2020 (Table 1): they have also received the highest number of WOM reviews. The respective "number of lifts," "number of courses," "number of lift users in 2020-2021," "number of lift users in 2021-2022," "number of lift users in 2022-2023," "area (ha)," "ticket price (adult day pass)," "distance from the city center (Distance)," and "webpage description."

Table 2 shows the average maximum and minimum values of the basic information of the ski resorts. Their characteristics show that the number of lift users increased between 2020 and 2023, half of the night-time operations are open, and the average travel time from the city center is 2.26 hours.

Second, regarding the WOM, the total number collected was 23,343 (Table 3). After removing "no blanks" and "more than

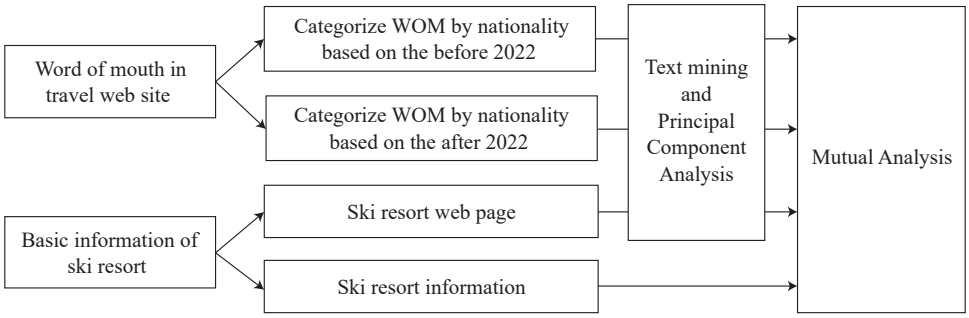

Figure 1: Analysis framework

Table 1: Ski resort name

Sapporo	(1) Sapporo Teine
	(2) Sapporo Kokusai Ski Resort
	(3) Sapporo Bankei Ski Area
	(4) Sapporo Moiwayama Ski Resort
	(5) Fu's Snow Area
	(6) Takino Snow World
Nozawa Onsen	(7) Nozawa Onsen Ski Resort
Akai Village	(8) Kiroro Resort
Hakuba	(9) Hakuba Happo-one Ski Resort
	(10) ABLE Hakuba Goryu Ski Resort
	(11) Hakuba Iwatake Snow Field
	(12) Tsugaike Kogen Ski Resort
Yuzawa	(13) GALA Yuzawa Ski Resort
	(14) Naeba Ski Resort
	(15) Kagura Ski Resort
Myoko	(16) Myoko Suginohara Ski Resort

Table 3: The total number collected from web site resorts

Resort	Google map	Asoview	Jalan
(1)	1739		181
(2)	1148		166
(3)	1070		175
(4)	737		84
(5)	525		
(6)	711		
(7)	1238		619
(8)	1091	75	
(9)	1197		983
(10)	1232		207
(11)	1418	979	
(12)	779	1874	
(13)	1100	121	
(14)	1207	69	
(15)	1092	354	
(16)	873	299	

10 words," the valid WOMs were 16,353, Japanese: 12,793(pre-COVID period is 4,419 and post-COVID period 8,374), Chinese: 675 (pre is 285 and post is 390), and Europe: 2885 (pre is 1,076 and post is 1,809).

4.2 Text mining analysis and principal component analysis

Initially, only nouns were counted by the morphological analysis on the WOM and ski resort web pages. Table 4 lists the top 10 words. Foreign languages, such as Chinese and English, are translated into Japanese, and morphological analysis is performed.

Before 2020, the WOM reviews were dominated by words related to the user's skill level and experience, such as "beginner," "advanced," and "child," which were mainly evaluated from the user's perspective. In contrast, after 2020, the focus shifted to facility convenience and services, such as "lift," "parking," and "rental," with an increasing number of evaluations of improved facilities. In addition, physical features such as "slopes," "mountain peaks," and "altitude" are emphasized in the website introduction.

Next, PCA was conducted on words obtained from the morphological analysis. The selection criteria for PCA were an eigenvalue ≥ 1 (Kaiser-Guttman criterion), and a contribution rate until the cumulative contribution rate reached 70 %-80 %.

Regarding the overall WOM, the remaining words were similar before and after 2020 (Table 5 and 6). For example, the first principal component was "gondola" and "slopes" before 2020 and "best" and "gondola" after 2020, and several sentences were about resort facilities and families. Therefore, we read the sentences before and after the WOM and named them by calling around the common words. It was assumed that the first principal component was "facilities used" before 2020 and "services provided" after 2020. Similarly, the second principal

Table 4: Top 10 words in word-of-mouth occurrence frequency

Reviewed before 2020	WOM since 2020	Web page introduction
Beginner	Lift	Slopes
Lift	Supreme	Advanced level
Slopes	Slopes	Beginner
Supreme	Gondola	Summit
Gondola	Beginner	Altitude
Scenery	Scenery	Experience
Time	Time	Glide
Advanced level	Rental	Family
Child	Parking	Tourism
Resort	Child	Play

Table 2: Basic information on the ski resorts

	Number of lifts	Number of courses	Number of lift users (2020-2021)	Number of lift users (2021-2022)	Number of lift users (2022-2023)	Area (ha)	Night skiing (yes1, no, 0)	Ticket price (adult one-day pass)	Travel time from the city center (h)
Mean	11.06	16.94	575,786.25	650,298.75	715,155.88	131.48	0.50	5,808.75	2.26
Maximum value	21	44	2,319,000	2,578,000	2,859,000	297	1	8000	4.5
Minimum value	1	1	59,000	88,000	121,000	5	0	2040	0.3

Table 5: Principal component loadings of overall reviews before 2020

	Facilities used	Services provided	Play experience
gondola	0.20	0.00	0.03
slopes	0.17	0.06	0.07
best	0.22	0.06	0.01
children	0.13	0.01	0.03
advanced	0.01	0.29	0.00
lift	0.00	0.27	0.10
scenery	0.10	0.00	0.24
time	0.05	0.06	0.20
resort	0.12	0.00	0.19
beginners	0.00	0.25	0.13
Eigenvalue	3.62	2.38	1.59
Contribution Rate (%)	36.18	23.82	15.94
Cumulative Contribution Rate (%)	36.18	60	75.94

Table 6: Principal component loadings of overall reviews after 2020

	Services provided	Facilities used	Play experience
best	0.18	0.03	0.00
time	0.15	0.02	0.06
gondola	0.15	0.01	0.11
slopes	0.04	0.28	0.04
lift	0.05	0.21	0.11
parking	0.07	0.17	0.12
rental	0.07	0.17	0.13
beginners	0.09	0.06	0.25
children	0.11	0.04	0.17
Eigenvalue	4.65	2.09	1.12
Contribution Rate (%)	46.47	20.93	11.16
Cumulative Contribution Rate (%)	46.47	67.4	78.56

component was “lift” and “advanced” before 2020 and “lift” and “rental” after 2020. This component is related to services for advanced users and a wide range of users and thus was named “services provided” before 2020 and “services used” after 2020. The third principal component was named “play experience” for “scenery,” “time,” and “resort” before 2020 and “beginners” and “children” after 2020. These terms are mostly

Table 7: List of principal component analysis nomenclature

Categroy	Year	Principal component	Eigenvalue	Contribution Rate (%)	Cumulative Contribution Rate (%)
Overall	before 2020	Facilities used	3.62	36.18	36.18
		Services provided	2.38	23.82	60.00
		Play experience	1.59	15.94	75.94
	after 2020	Facilities used	4.65	46.47	46.47
		Services provided	2.09	20.93	67.40
		Play experience	1.12	11.16	78.56
Japanese	before 2020	Facilities used	3.65	36.50	36.50
		Services provided	2.47	24.74	61.24
		Play experience	1.45	14.47	75.71
	after 2020	Facilities used	4.47	44.65	44.65
		Services provided	2.08	20.79	65.44
		Play experience	1.29	12.90	78.34
Europe	before 2020	Services provided	3.94	39.42	39.42
		Play experience	2.00	19.97	59.39
		Facilities used	1.42	14.21	73.60
	after 2020	Services provided	4.12	41.49	41.49
		Play experience	1.83	18.30	59.48
		Facilities used	1.76	17.60	77.08
Chinese	before 2020	Services provided	4.01	40.11	40.11
		Facilities used	1.85	18.46	58.58
		Play experience	1.73	17.31	75.88
	after 2020	Services provided	3.47	34.68	34.68
		Facilities used	2.85	28.51	63.19
		Play experience	1.45	14.46	77.64

related to experience value, families, and beginners.

Similarly, the remaining words in the other Japanese, Chinese, and European principal component factor names had a high similarity. Thus, we began naming the three categories as "services provided," "facilities used," and "play experience (Table 7)."

We collected web information on ski resorts, performed morphological analysis, and conducted a PCA of the results in Table 8. Then, the sentences before and after the remaining words were read, and the principal factors were termed "attractiveness of the natural environment," "degree of responsiveness to user groups," "diversity of activities," and "degree of tourism at the resort."

5. Word-of-mouth analysis using principal component scores

5.1 Correlation analysis between word of mouth and basic resort information

A correlation analysis was performed between each resort's PCA scores and basic information. As Table 9 shows, resorts with p-value ≤ 0.05 indicate correlation.

The main factor "facilities used" around 2020 and the resort's "total number of courses," "ticket price," "number of lifts," "travel time from the city center," and "area," showed a significant correlation. These results demonstrate the following. First, the larger the ski resort, the lower the evaluation of the facilities used. Particularly, the large number of facilities at large ski resorts may not allow for adequate overall maintenance and updating. As a result, maintaining a comfortable environment for users has become a challenge. This condition has led to lower evaluations. Second, the larger the scale of the ski resort, the more it needs to accommodate a diverse range of users. However, if facilities are inadequately provided specifically for certain user groups (e.g., beginners and advanced skiers), then the overall evaluation may be reduced. Finally, users cannot easily perceive the "accessibility" and "fulfillment" of the facilities because of the sheer size of a ski resort. For example, although many lifts and gondolas are available, the design of the access and flow lines may not lead to user experience

Table 8: Principal component loadings of web information on ski resorts

	Attractiveness of the natural environment	Degree of responsiveness to user groups	Diversity of activities	Degree of tourism at the resort
summit	0.25	0.01	0.01	0.00
family	0.18	0.06	0.06	0.03
elevation	0.18	0.02	0.14	0.00
sightseeing	0.13	0.04	0.12	0.14
beginner	0.07	0.25	0.01	0.00
advanced	0.03	0.21	0.12	0.04
skiing	0.02	0.20	0.12	0.00
play	0.03	0.14	0.13	0.09
experience	0.08	0.05	0.00	0.48
slopes	0.03	0.03	0.30	0.21
Eigenvalue	2.71	2.24	1.39	1.18
Contribution Rate (%)	27.12	22.41	13.87	11.76
Cumulative Contribution Rate (%)	27.12	49.53	63.4	75.16

Table 9: The correlation analysis outputs between PCA scores and basic information

Principal component score items	Ski resort basic information	correlation	p-value
facilities used-bf2020	Total number of courses	–0.62	0.01
	Ticket price (adult)	–0.73	0.00
	Number of lifts	–0.81	0.00
	Travel time from the city center	–0.89	0.00
	Area	–0.62	0.01
facilities used-af2020	Total number of courses	–0.58	0.02
	Ticket price (adult)	–0.70	0.00
	Number of lifts	–0.74	0.00
	Travel time from the city center	–0.79	0.00
	Area	–0.65	0.01

satisfaction.

5.2 Word-of-mouth's year-over-year comparison by country

Year-over-year comparison is made from the PCA scores as illustrated. Chinese nationals were excluded from the analysis in this study because of their small number of arrivals after 2020. First, Japanese (Figure 2) and Europe (Figure 3) were compared using "facilities used-bf2020" and "facilities used-af2020" on the x- and y-axis, respectively. The two groups primarily differ in regional characteristics. Japanese respondents are concentrated in the Sapporo region (1)-(5) and the Nagano region (9)-(12), whereas Europe are scattered. Japanese people visit ski resorts with the intention of exploring different regions, seeking variety in their travel experiences. In contrast, European visitors do not exhibit the same tendency, often preferring to visit familiar or nearby resorts rather than traveling to different regions. This difference in travel behavior may be influenced by factors such as cultural preferences, geographic proximity of ski resorts, and the availability of domestic options. In addition, as shown in the upper left corner, the number of reviews of the facilities used after the onset of COVID-19 demonstrated a noticeable increase and decrease, though the Europe differ between resorts.

In addition, the following can be analysed from the WOM trends. The analysis of the scatter plots shows clear differences in the evaluations between "services provided" of Japanese (Figure 4) and of Europe (Figure 5). The Japanese tended to rate the quality of services in the Sapporo region.

Figure 5 Scatter Plot of services provided-bf2020 and services provided-af2020 in Europe indicating room for improvement in the facilities and equipment. In the Nagano region, the Japanese rated the facilities and equipment with high scores, indicating satisfaction. These results suggest that the Japanese value regional characteristics, accessibility, and tourist destination characteristics. In contrast, inbound tourists highly appreciate the international service response of the Sapporo region, though they indicated that the facilities and equipment must be adequately enhanced. Regarding the Nagano region, although they positively evaluated the scale and quality of facilities, they noted that the responsiveness of service provision needs improvement. This result suggests that inbound tourists evaluate facilities based on their characteristics and international standards of service rather than on regional characteristics. Therefore, the Japanese value regional characteristics and pro-

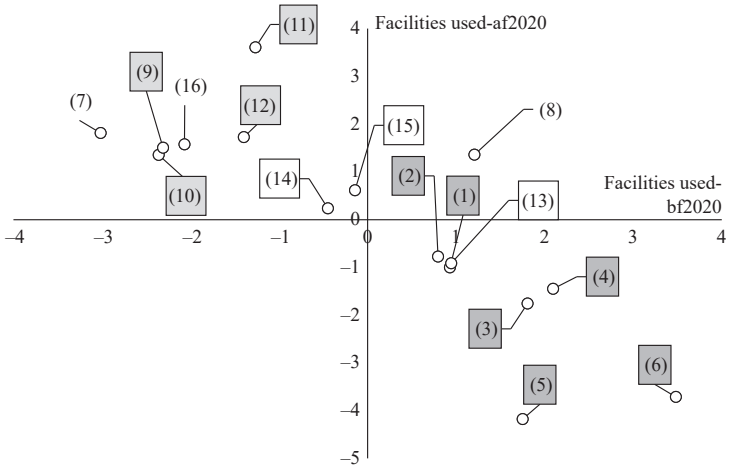

Figure 2: Scatter plot of facilities used-bf2020 and facilities used-af2020 in Japan

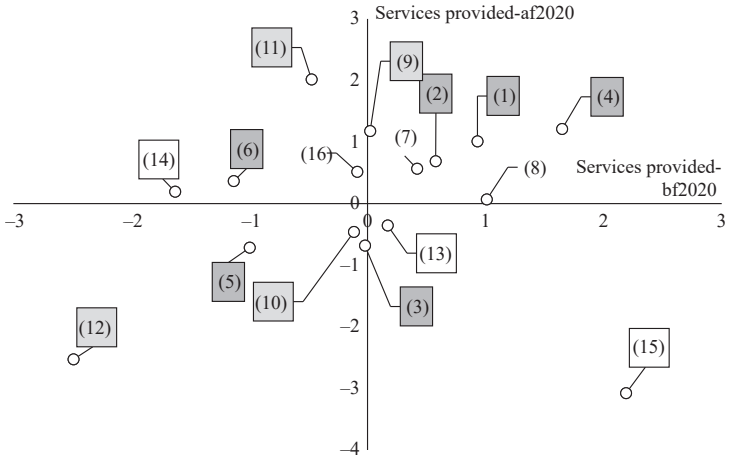

Figure 3: Scatter Plot of facilities used-bf2020 and facilities used-af2020 in Europe

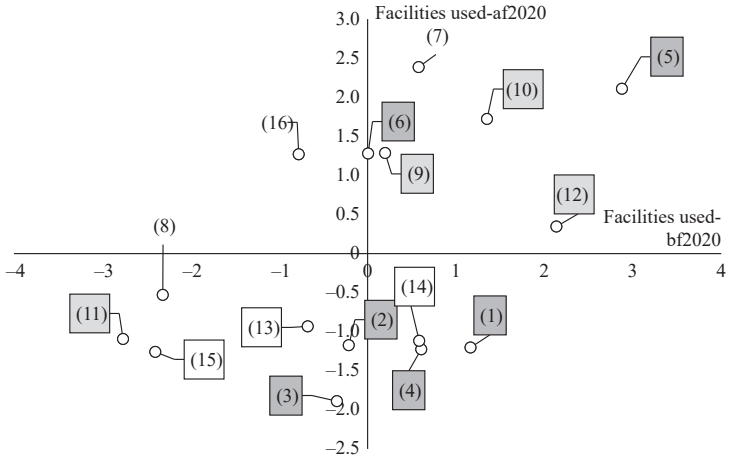

Figure 4: Scatter Plot of services provided-bf2020 and services provided-af2020 in Japan

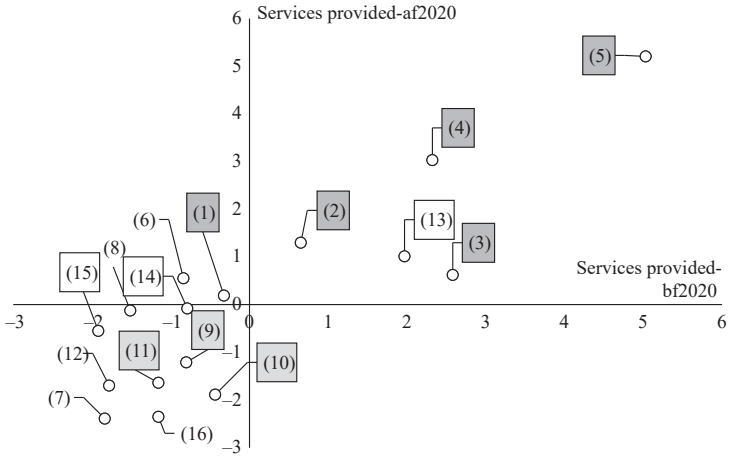

Figure 5: Scatter Plot of services provided-bf2020 and services provided-af2020 in Europe

vide evaluations based on individual regional characteristics, whereas inbound tourists evaluate facilities and service standards from an international perspective. Considering these differences, improving the facilities and equipment in the Sapporo region and service responsiveness in the Nagano region is an important issue that must be addressed.

5.3 Word-of-mouth factors affecting resorts

Finally, we analyzed the relationship between the PCA scores on the resort web pages and WOM information after 2020. Table 10 shows the results of multiple regression analysis with the PCA factor from the resort web pages as the objective variable and "facilities used-af2020," "services provided-af2020," and "play experiences-af2020" as explanatory variables. The data are standardized and therefore are standardized partial regression coefficients.

For the Japanese, the coefficient of determination (R^2) is low, indicating no impact. In contrast, the R^2 coefficient is high for the Europe. Particularly, the "attractiveness of the natural environment" is greatly influenced by "services provided-af2000" and "play experience-af2000." Europe often have a cultural background that values "coexistence with nature" and "sustainability." Thus, they particularly tend to value services that utilize the natural environment. In contrast, the "degree of responsiveness to user groups" negatively impacts "facilities used-af2020." From the Europe perspective, the lack of responsiveness to the user base reduces satisfaction with the use of facilities. Conversely, WOM shows a negative impact on the increase in the number of users, particularly due to the negative impact of crowding. Waiting times for lifts and congestion in the facility may reduce "comfort" and "satisfaction," which may trigger negative WOM. The experience quality is also affected by the increase in the number of users. In particular, the "attractiveness of the natural environment" and the "degree of responsiveness to user groups" have been reduced due to the loss of a sense of tranquillity and relaxation.

6. Conclusion

In this study, basic information and WOM were collected for 16 ski resort areas that participated in the MLIT's Project to analyse the impact of WOM on ski resort development before and after the onset of COVID-19 in 2020 between countries and after FY 2020. The results of the RQ analysis are as follows. For "RQ1: Do WOM trends differ before and after the

Table 10: The results of multiple regression analysis

			Facilities used -af2020	Services provided -af2020	Play experience -af2020	R^2
Japanese	Attractiveness of the natural environment	Standardized Regression Coefficient	–0.36	–0.09	0.22	0.18
		t value	(–1.37)	(–0.34)	(0.83)	
	Degree of responsiveness to user groups	Standardized Regression Coefficient	0.26	–0.04	–0.22	0.12
		t value	(0.97)	(–0.14)	(–0.8)	
	Diversity of activities	Standardized Regression Coefficient	–0.21	–0.50	0.05	0.29
		t value	(–0.86)	(–2.06)	(0.21)	
	Degree of tourism at the resort	Standardized Regression Coefficient	–0.25	0.12	0.28	0.16
		t value	(–0.94)	(0.46)	(1.05)	
Europe	Attractiveness of the natural environment	Standardized Regression Coefficient	–0.31	0.49	0.33	0.44
		t value	(–1.45)	(2.24)	(1.5)	
	Degree of responsiveness to user groups	Standardized Regression Coefficient	–0.50	–0.25	–0.13	0.33
		t value	(–2.11)	(–1.07)	(–0.56)	
	Diversity of activities	Standardized Regression Coefficient	0.07	0.33	0.27	0.19
		t value	(0.25)	(1.28)	(1.04)	
	Degree of tourism at the resort	Standardized Regression Coefficient	–0.01	0.51	–0.60	0.62
		t value	(–0.04)	(2.9)	(–3.38)	

onset of COVID-19 in 2020 between countries?" the year-over-year WOM comparisons showed a clear difference for the Japanese but not for the Europe. "RQ2: Does WOM change due to the development of ski resorts?" is possible considering that the cultural background of the Europe has changed the trend.

The above analysis and discussion indicate that the effects of ski resort development differ between countries. Furthermore, ski resort development is an effective public investment, particularly in terms of the expected effect on inbound tourists.

Future studies can analyse Chinese visitors, who are expected to have high spending in Japan. Increasing the number of target ski resorts is also useful for accurate analysis.

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