Analysis of Japanese beauty salon website by using topic model and covariance structure analysis

Yoshiki Nakamura (Department of Business Administration, Aoyama Gakuin University, nakamura@busi.aoyama.ac.jp, Japan)

Nozomi Oomiya (Faculty of Advanced Engineering, Nippon Institute of Technology, n.oomiya@nit.ac.jp, Japan)

Abstract

A foreign traveler has many purposes while abroad. Some research tells eating delicious foods was travelers' first priority and that visiting a hair salon was their seventh priority. Thus, foreign tourists are interested in visiting hair and beauty salons and would likely visit a beauty salon in Japan if they had a chance. there is much information for searching salons. However, they don't have enough time to search for information. This study used data from the beauty salon website Hot Pepper Beauty, extracted 55,580 data. We analyzed these data and demonstrated the relationship among website data. The research method was as follows: first, a basic calculation was conducted for assessment elements that depended on the area. Second, a topic model was developed for investigating a part of the shop's information, the stylist's report, and the client examiner's sentence. Third, an expected value computes each topic word and attempted to conduct correlation analysis. The analysis of the covariance structure also attempted to analyze the potential of the thematic model and evaluation. We obtained several outputs from these outputs and found future discussion topics for not only tourists but also shop managers and their staff.

Keywords

topic model, hair and beauty salons, word-of-mouth analysis, covariance structure analysis, foreign traveler's interesting

1. Introduction

Generally, a foreign traveler has many purposes while abroad. For example, visiting a heritage place, experiencing culture, and eating local food. Recruit [2022] found that eating delicious foods was travelers' first priority and that visiting a hair salon was their seventh priority. Thus, foreign tourists are interested in visiting hair and beauty salons and would likely visit a beauty salon in Japan if they had a chance. Individuals interested in visiting beauty shops search for information on, for example, websites and social network services. Review sites are especially used and have much information on a shop's characteristics and customer reviews. Websites and social network services provide information such as a shop's location, the types of stylist services available, and reviews. Referring to this information, potential customers can decide whether to patronize the shop. These data are crucial for potential customers and employed staff. The staff benefits because they can share their problems so that the shop can improve, for example, customer service improvements. Websites, however, do not provide this useful information. Notably, tourists have little time to search for information; thus, they require a large amount of information quickly by using organized data.

In this study, we used data from the beauty salon website Hot Pepper Beauty [2022]. These data were offered by the National Institute of Informatics and comprised three sections: shop, stylist, and review. Each section had data on the shop, for example, the address, the number of staff, the shop's appealing points, stylists' introductions and tech-niques, customer reviews, and the shop's assessment. We analyzed these data and demonstrated the relationship among them. Our aim in this study was to find trends and guidance for tourists.

2. Related research

Various researchers have focused on beauty salons. The main approach used is based on customer satisfaction [Van et al., 2016; Khan and Tabassum, 2012; Seon-Bok, 2016]. Hyun-jin [2013] analyzed the relative importance of experiential marketing on customer satisfaction and the revisit intention of beauty salon franchise shops. Another study analyzed 350 questionnaires and conducted factor analysis to determine the effectiveness of experiential marketing and the level of customer satisfaction of a beauty salon. Na-Nan et al. [2015] examined the effectiveness of organizational commitment, service quality, and customer satisfaction factors. In another study, 480 customers' data were collected, and a covariance structure analysis was consistent, demonstrating that factors such as customer satisfaction, service quality, and employee engagement directly affect customer loyalty. Eggert and Ulaga [2002] investigated an interrelationship between customer satisfaction and customer value to reduce ambiguities surrounding both concepts. Their research suggested that value and satisfaction can be conceptualized and measured distinctly.

Second, much research on service quality has been conducted. Sultana et al. [2016] attempted to measure customer satisfaction using the SERVQUAL model in beauty parlors. Their linear regression analysis identified tangibility as the most important factor. Shahbazi and Akareem [2013] identified the service quality dimensions that could be the point of communication to develop relationships with customers. They

said that educational qualifications and respondents' monthly expenditures directly influenced demographic values and had strong managerial implications for designing their value proposition to increase sustainability.

Third is human resource (HR) management. Ulrich et al. [1991] suggested that employee–customer integration would create a competitive advantage. They also suggested a framework for making this connection and implications for HR practices and its professionals. Lu et al. [2015] investigated the relationship between a firm's HR management system and its performance. The collected data from managers and front-end professional service employees implied that age diversity strengthens a high-performance work system and performance relationship.

Fourth, they focus on a brand management [Celuch et al., 2007; M'zungu et al., 2017]. Low and Lamb [2000] empirically tested a conceptualization of brand associations that consists of three dimensions: brand image, brand attitude, and perceived quality. One finding confirmed the efficacy of the brand image protocol and indicated that brand associations differ across brands and product categories. Lim and Chae [2014] examined the relative importance level of experience marketing on brand attitude and brand loyalty in beauty salon franchise shops. Solomon et al. [2004] conducted an observational study in beauty salons to gain insights into naturally occurring conversations between cosmetologists and customers and assess features of the salon environment.

Finally, review analyses have been conducted. Filieri and McLeay [2014] focused on travel site reviews and tested the relationships between the reviews and product ranking, information accuracy, value-added information, and information relevance and timeliness. He et al. [2017] found that star-rating reviews correlated with online customer textual reviews. They also revealed that extremely satisfied and dissatisfied hotel customers shared common interests in five categories: food, location, rooms, service, and staff. Susilowati and Sugandini [2018] analyzed a structural model from 300 questionnaires describing the causal relationship between electronic word-of-mouth, traditional word-of-mouth, perceived value, and perceived quality to staying image of vacation tourists. Few researchers have focused on the beauty salon site. For example, Yun-Yung et al. [2018] distributed a questionnaire to 130 beauty salon consumers. Using the data obtained, they employed grey relation analysis to identify the key factors affecting the revisit intention of consumers in the beauty salon industry. They found factors that affected the repurchase intention of consumers from the perspectives of the beauty salon customers.

In this body of relative research, no approaches to analyze relationships with the shop information, the stylistic report, and review comments have been reported. Thus, this research analyzes the relationship among them by using a topic model and covariance structure analysis. Regarding the outputs, we aim to find more clearly researched outputs than in the literature, such as quality service, HR management, and brand management. We also discuss the trends of the beaty shop in Japan and suggest problem solving measures for shop management.

3. Materials and research method

This chapter describes reference data and the flow of analysis. This research refers to the site: Hotpepper Beauty [Recruit, 2022]. This site is a search and booking site for hair salons and aesthetics shops. It is the largest site in Japan, with 35 million users and 111 thousand shops. These research data include the assessment of the shop, the introduction of the stylist, and the comments of the users. The amount of data used was 365,809 cases. The collection period was from January 11, 2012, to January 9, 2014. Data were collected across all regions of Japan. Thus, this search focused on four domains: Tokyo-Marunouchi, Shinjuku, Meguro, and Musashino. Finally, after excluding data that did not fulfill the inclusion criteria, we examined 55,580 cases.

The research method was as follows: first, a basic calculation was conducted for assessment elements that depended on the area. Assessment elements were mood, a service satisfaction,

Figure 1: Data structure

Reviewer ID	Gender	Age	Mood	Service satisfaction	Technical capacity	Menu execution	Overall	Longitude	Latitude	Expected value of store messages by Topic	Expected value of stylist review by Topic	Expected value of review comments by Topic
Review 1	F	20	5	3	4	2	5	35.38.35.○	139.42.48.○	0.0391	0.0548	0.0409
Review 2	F	10	2	4	5	4	4	35.38.35.○	139.42.48.○	0.0604	0.0465	0.0222
Review 3	F	20	4	5	1	5	5	35.38.35.○	139.42.48.○	0.0554	0.0982	0.0758
Review 4	M	30	5	2	2	4	3	35.38.35.○	139.42.48.○	0.0265	0.0858	0.0757
Review 5	F	50	3	3	4	2	5	35.38.35.○	139.42.48.○	0.0099	0.0191	0.0209
·	·	·	·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·	·	·	·
·	·	·	·	·	·	·	·	·	·	·	·	·

technical capacity, menu execution, and overall. Second, a morphological analysis was performed using Mecab. After that, nouns, sa-hen nouns, and adjectives were extracted. A topic model was performed using their results. The topic model was developed for investigating a part of the shop's information, the stylist's report, and the client examiner's sentence. Topic modeling is a machine learning technique capable of scanning a set of documents, detecting word and phrase patterns within them, and automatically clustering word groups and similar expressions that best characterize a set of documents [Blei et al., 2003; Nakamura and Oomiya, 2020; 2021]. Some trends and specifications are clear in all parts of the text according to this calculation. Third, an expected value computes each topic word based on the review's ID (Figure 1). Using their values, we first attempted to conduct correlation analysis. The outputs clearly established the relationship among the data. Second, in the analysis of the covariance structure, we attempted to analyze the potential of the thematic model and evaluation. This analysis carries out a stratified analysis, which examines the outputs according to the area. Finally, the area analysis led to finding specifications. We discuss, from the dataset, three findings: (1) the trend of the subject is compared with each text data, (2) the trend of the dataset has deepened over an area, and (3) the relationship between the dataset.

4. Results and considerations

Our results are as follows. First, the basic calculation was conducted. Table 1 shows an average of the assessment elements in each classification. All the data of the assessment elements were more than 4.5, and 5 was the maximum. The male's score was higher than that of the females' score. Among a generation, 10's was the highest value, and 60's was the lowest value. Among the areas, the trend of orders was similar except for "menu execution." The Tokyo-Marunouchi area was the highest, and the Musashino area was the lowest. There were differences and characteristics in each classification.

Second, the topic model attempts to analyze the text data and clarify the tendency. The targeted texts are "shop information," "stylist information," and "review comments." A topic name determines what type of word remains in each topic. Table 2 shows the results of the topic model. Table 2, on the left, depicts the outcomes of the shop. The right side, on the other hand, shows the expected value. They classified two topics: perplexity and coherence (Figure 2). Topic 1 consists of "style," "hair," "day," "salon," "person," "customer," "color," "shop," "technique," and "me." This group named a "style" because its arrangement images say that "we can give your own style." The other topic names as well. Topic 2 contains "staff," "color," "salon," "customer," "come to the shop," "waiting," "shop," "station," "in the middle," and "cut." This group named "staff" because the sentence insists on care for the customer and appealing to the customer to select their shop. The stylist's text also had two topics. Their trends were appeal to stylist's own technique and the possibility of satisfaction. Topic 1 contains words, for example, "good (method)," "style," "natural," "system," "cut," "short," "men's," "bob (style)," "perm," and "informal." thus, this topic was named "stylist technique." Topic 2 rests "cosmetologist," "master," "experience," "salon," "technique," "work," "room," "cut," "photograph," and "unchangeable." Therefore, this topic was called "stylist's appeal." The customer review's text contained three topics: "shop information and staff," "customer order what they have done," and "shop atmosphere." Thus, every topic names the "information," "order," and "atmosphere." Various considerations were observed from the analysis of these outputs.

Using the topic outputs, we used correlation analysis to conduct an assessment. We can, therefore, discuss some relationships based on these outputs. To prepare for this analysis, we calculated the expected value of each topic word

Table 1: Basic calculation

	Mood	Service satisfaction	Technical capacity	Menu execution	Overall
All data	4.576	4.679	4.712	4.551	4.685
F	4.573	4.676	4.709	4.548	4.682
M	4.623	4.730	4.756	4.580	4.731
10s	4.727	4.764	4.771	4.627	4.768
20s	4.618	4.696	4.731	4.558	4.707
30s	4.517	4.646	4.690	4.538	4.651
40s	4.507	4.654	4.687	4.529	4.653
50s	4.462	4.638	4.672	4.525	4.621
60s	4.354	4.532	4.544	4.513	4.487
Tokyo-Marunouchi	4.491	4.613	4.663	4.544	4.631
Shinjuku	4.512	4.634	4.665	4.564	4.640
Meguro	4.645	4.735	4.768	4.569	4.742
Musashino	4.618	4.724	4.725	4.513	4.704

Table 2: Outputs of topic model

(a) Shops information

Topic 1: Style		Topic 2: Staff	
style	0.0119	staff	0.0291
hair	0.0118	color	0.0196
day	0.0104	salon	0.0191
salon	0.0099	customer	0.0161
person	0.0098	come to the shop	0.0149
customer	0.0088	waiting	0.0137
color	0.0086	shop	0.0120
shop	0.0078	station	0.0087
technique	0.0078	in the middle	0.0086
me	0.0074	cut	0.0077

(b) Stylist information

Topic 1: Stylist technique		Topic 2: Stylist's call	
good (method)	0.1450	cosmetologist	0.0878
style	0.0994	master	0.0473
natural	0.0610	experience	0.0292
system	0.0522	salon	0.0219
cut	0.0516	technique	0.0160
short	0.0329	work	0.0154
men's	0.0320	room	0.0137
bob (style)	0.0217	cut	0.0135
perm	0.0195	photograph	0.0102
informal	0.0147	unchangeable	0.0095

(c) Review comments

| Topic 1: Information		Topic 2: Order		Topic 3: Atmosphere	
shop	0.0676	reserve	0.0269	time	0.0431
atmosphere	0.0512	time	0.0254	enjoy	0.0307
staff	0.0305	person	0.0236	chat	0.0282
person	0.0224	time	0.0153	happy	0.0274
salon	0.0208	in charge	0.0148	smile	0.0229
feeling	0.0206	price	0.0143	in charge	0.0225
inside of the shop	0.0151	cut	0.0132	person	0.0198
good	0.0149	price	0.0127	it was fun	0.0178
stylist	0.0149	disappointing	0.0122	stylist	0.0177
me	0.0133	visit	0.0116	satisfy	0.0171
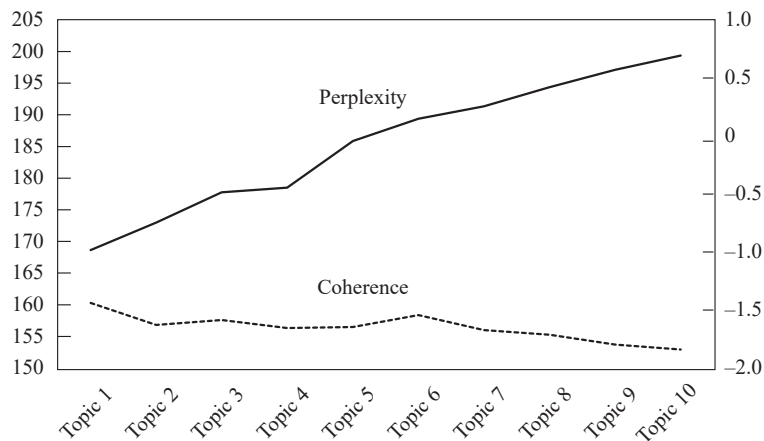
Figure 2: Perplexity and coherence (in case of the shop's information)

based on the reviewer ID (Figure 1). Therefore, each ID has information, such as the expected value in each topic; the valuation value; and basic information, namely, gender and generation. The relationship between the data is shown in Table 3.

** is a significant difference less than 1 %, and * is less than 5 % based on a test of non-correlation. There was a strong relationship between assessment elements, especially "mood" and "service satisfaction," "service satisfaction" and "technical capacity," and "technical capacity" and "menu execution." Next, the relationship was considered based on the evaluation and the topics. The assessment of "mood" had a stronger connection with stylist information in topics 1 and 2. The shop's mood is developed by the stylist, not the shop's atmosphere. The trend of service satisfaction was the same.

Finally, the analysis of the covariance structure was un-

Table 3: Correlation analysis

		Mood	Service satisfaction	Technical capacity	Menu execution	Overall
Mood		–	0.625	0.477	0.426	0.609
Service satisfaction		0.625 **	–	0.614	0.469	0.749
Technical capacity		0.477 **	0.614 **	–	0.509	0.811
Menu execution		0.426 **	0.469 **	0.509 **	–	0.600
Overall		0.609 **	0.749 **	0.811 **	0.600 **	–
Shop	Topic 1: Style	−0.022 **	−0.009 *	−0.020 **	−0.002	−0.016 **
	Topic 2: Staff	−0.049 **	−0.030 **	−0.033 **	0.027 **	−0.031 **
Stylist information	Topic 1: Stylist technic	0.080 **	0.061 **	0.052 **	−0.014 **	0.056 **
	Topic 2: Stylist's call	0.041 **	0.021 **	0.031 **	−0.001	0.028 **
Review comments	Topic 1: Information	0.104 **	0.039 **	0.007	0.015 **	0.030 **
	Topic 2: Order	−0.088 **	−0.105 **	−0.090 **	−0.046 **	−0.107 **
	Topic 3: Atmosphere	0.036 **	0.044 **	0.053 **	0.047 **	0.051 **
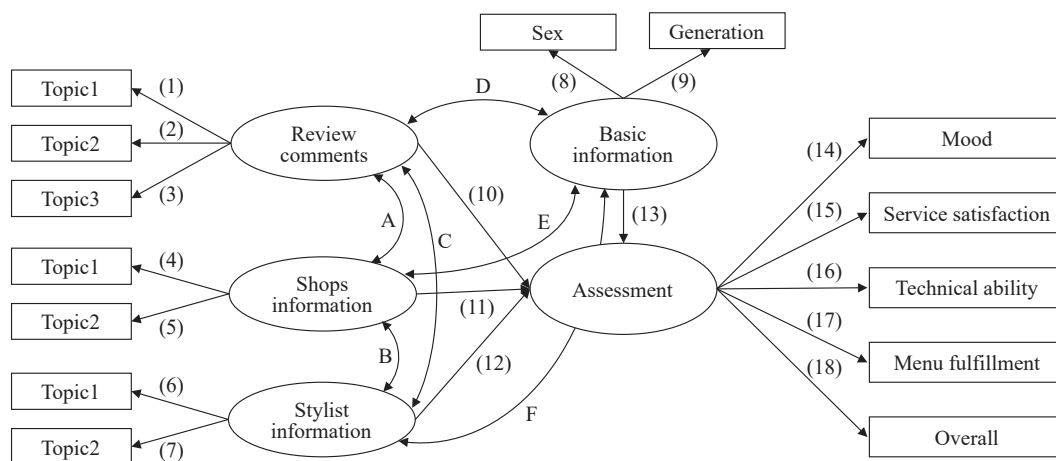
Figure 3: The model of the covariance structure

Table 4: The goodness of fit model

Area	χ^2	*P* value	GFI	AGFI	CFI	RMSEA	AIC
All data	179.825	0.000	0.967	0.952	0.945	0.057	12835.609
Tokyo-Marunouchi	22.493	0.000	0.968	0.952	0.950	0.056	1644.492
Shinjuku	70.722	0.000	0.946	0.923	0.909	0.073	5295.413
Meguro	67.851	0.000	0.970	0.955	0.947	0.055	4819.591
Musashino	26.106	0.000	0.936	0.908	0.895	0.079	1969.724

dertaken. It is a statistical technique for a theoretical model. It is constructed and predicted by the theoretical model compared with those of the observed data. With this model, we discovered additional details in each area and thus could discuss an impact where the subject has been influenced by the overall evaluation. Figure 3 presents the model. A square is an observable variable. An ellipse is a latent variable. The latent variable is a concept of composition and not observed directly. On the left side of the ellipse are three latent variables: "shop information factor," "stylist information fac-

tor," and "comment review factor."." Each latent variable is composed of each topic. On the right side of the ellipse is the "assessment factor" derived from the evaluation elements. On the top, the basic information factor involves gender and generation. AMOS 29 was used in this analysis [Blunch, 2013]. The unidirectional arrow "→" is a standardized coefficient with a strong influence on the observable variable near 1. The bidirectional arrow "↔" is the correlation coefficient among the observable variables. Its value indicates a stronger relationship in cases near a value of 1. Table 4 illustrates

Table 5: Results from the covariance structure analysis

	All data	Tokyo-Marunouchi	Shinjuku	Meguro	Musashino
(1)	0.326	0.027	0.388	0.420	0.405
(2)	0.937	−0.104	0.978	0.918	0.910
(3)	0.772	0.024	0.718	0.781	0.784
(4)	0.974	−0.722	0.937	0.985	0.952
(5)	0.503	0.305	0.525	0.483	0.515
(6)	0.191	0.954	0.078	0.170	0.702
(7)	0.150	0.767	0.209	−0.312	0.073
(8)	0.059	0.599	0.000	0.042	0.178
(9)	0.117	0.209	−0.040	0.106	0.140
(10)	0.030	0.940	0.023	0.045	0.028
(11)	0.025	0.615	0.016	0.212	0.018
(12)	0.034	0.792	0.009	0.034	0.083
(13)	−0.454	0.828	0.809	−0.694	−0.284
(14)	0.637	0.645	0.761	0.630	0.759
(15)	0.775	0.971	0.806	0.751	0.782
(16)	0.828	0.057	0.842	0.818	0.843
(17)	0.618	0.074	0.643	0.602	0.651
(18)	0.971	0.519	0.945	0.969	0.937
A	0.030	0.030	0.050	0.020	−0.010
B	−0.170	−0.380	0.120	−0.560	0.290
C	0.000	0.020	0.000	0.070	0.020
D	0.090	0.080	0.170	0.010	0.080
E	0.030	−0.020	−0.090	0.060	0.120
F	−0.360	−0.120	−0.360	−0.350	−0.170

the quality of the fit model and generally shows an elevated value. Therefore, this result was acceptable for comparison purposes. Table 5 summarizes the results of the covariance structure analysis. This is the normalizing factor of the coefficient (numeric number (1) to (18)) and the correlation coefficient among the observable variable factors (uppercase from A to F).

First, the outputs of all data are shown in detail. The standardizing coefficients of the comment review factor are higher. Most notably, Topic 2 was 0.937, and Topic 3 was 0.772. It also had a higher value, 0.974, in the shop information factor in Topic 1. Unfortunately, they do not affect the assessment factors from (10) to (12). There is no relationship between the topic and assessment. For details, see the area analysis in Figure 3. The Tokyo - Marunouchi area had the highest value in the stylist information factor: Topic 1 was 0.954, and Topic 2 was 0.767. The basic information of gender was 0.599. The most important findings were all factors that had a higher value than the assessment factor. The comment review factor was 0.940, the shop information factor was 0.615, the stylist information factor was 0.792, and the basic information factor was 0.828. These outputs were not observed in the other area. The Tokyo-Marunouchi area is the most competitive place for beaty shops; thus, customer satisfaction and reviews are important factors in aiming to be superior to the competition. The other three areas, Shinjuku, Meguro, and Musashino, had almost same tendency. In Topic 2, "order," and in Topic 3, the "atmosphere," had the highest values. They were more than 0.7 of the standardizing coefficients. In Topic 1, "style of the shop information" was more than 0.9. We found some tendency for customers in this area to consider the shop's situation, and this had a direct effect on the assessments. One difference among the three areas was the influence of the basic information factor on the assessment factor. (13) in Shinjuku was 0.809, but Meguro was −0.694, and Musashino was −0.284. Two values were the negative coefficient. The correlation analysis among the observable variables did not affect higher correlation.

Through these considerations, we found the difference in the strength points according to the area.

5. Conclusion

This study focused on the hair salon because foreign tourists are interested in visiting them. Individuals use the review site studied, which provides information on shop characteristics, assessments, and customer reviews. This study referred to

55,580 data from the beauty salons on the website and demonstrated a clear relationship among them. The targeted areas were Tokyo-Marunouchi, Shinjuku, Meguro, and Musashino. We analyzed two items by using their values and correlation analysis and covariance structure. We discussed that the trend of the dataset deepened in the area. We obtained several outputs from these outputs and found future discussion topics for not only tourists but also shop managers and their staff. The findings of this study can be applied to facilitate the reporting of foreigners. It will be possible to offer shops that correspond to its style depending on the region, look for the style and store notes one is looking for, and provide information about stores and designers by topic.

Future prospects are (1) expanding to other areas, (2) analyzing linkages among dependency words from the reviewer comments, and (3) developing an expanded model of the covariance structure analysis.

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