Original Article

Service quality evaluation of technical visits for foreign visitors

Kentaro Ito (Department of Industrial Engineering, Nagoya Institute of Technology, iken6325@gmail.com)
Hironobu Kawamura (Department of Industrial Engineering, Nagoya Institute of Technology, kawamura@nitech.ac.jp)

Abstract
In Japan, an increase in industrial tourism that makes uses the of regions' special characteristics is expected, particularly in Chukyo, with its flourishing manufacturing industry. Specific visitors making such "technical visits" are provided with focused technical and professional information. However, the actual technical visit process has not been sufficiently clarified. Using a case study of AVEX Inc., this paper evaluates the service quality of technical visits for foreigners based on SERVPERF. Structural equation modeling (SEM) is used to assess the hypotheses regarding relationships among model constructs.

Keywords
industrial tourism, SEM, SERVPERF, questionnaire survey, international comparison

1. Introduction

In the global travel market, the number of international travelers is projected to increase from 1.18 billion in 2015 to 1.8 billion by 2030, and it is extremely important to make this increasing inbound demand the cornerstone of Japan's growth strategy and regional revitalization. The number of foreign tourists in Japan has increased significantly since 2012, and the government aims to increase the number to 40 million by 2020. At the same time, with the diversification of needs, new approaches toward tourism focusing on regional characteristics, such as industrial tourism, are expected. As shown in Figure 1, the deviation of the value of shipped products indicates that in the Chukyo region, which is one of Japan's leading industrial production areas, technical visits that provide specialized and technical information for specific customer segments, such as on-site manufacturing inspections, have been attracting particular attention as a national growth strategy.

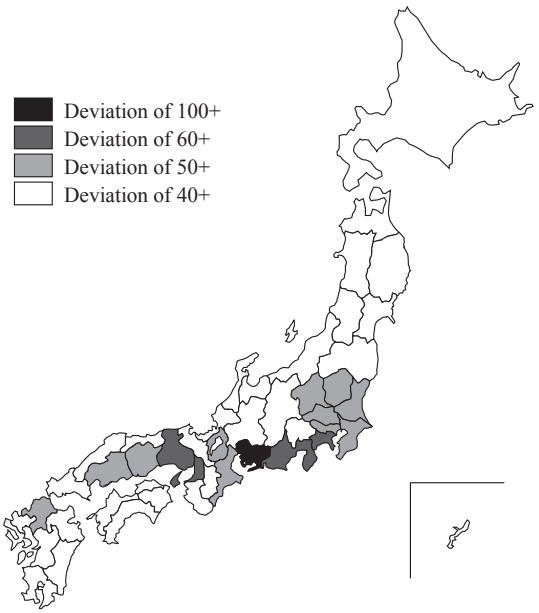

Figure 1: Deviation of shipment value of manufactured goods by prefecture (2015)
Source: Prepared by the author based on industrial statistics survey.

2. Previous research

Research on industrial tourism including Frew [2008] and Otgaar et al. [2010] is currently limited to exploring theoretical concepts. However, Cheng [2015] cites various studies on satisfaction levels and stresses their importance. In the area of technical visits, he has also verified a hypothetical model (factor-level satisfaction degree -> satisfaction level -> loyalty) at food and textile factories. Nevertheless, almost no similar studies have been conducted.

Rodney et al. [2006] make an international comparison of service quality assessments in the educational field. As shown in various studies in international comparisons, they also identified differences in the evaluation of service quality between different nationalities in the field of education.

3. Research question

This study attempts to evaluate the service quality of technical visits for foreigners provided by AVEX Inc., a small-to-medium manufacturing company in the Chukyo (Nagoya) region experiencing remarkable growth and actively encouraging technical visits. The three RQs below were formulated for the evaluation. As the research method, questionnaire surveys were conducted on foreign visitors who participated in technical visits to AVEX Inc.

- RQ 1: Examine how visitors from South Korea and China evaluate the service quality of technical visits of AVEX
- RQ 2: Verify whether the satisfaction model of Zeithaml et al. [2006] is valid in the hypothetical model developed in this research
- RQ 3: Verify the differences in evaluation of service quality between different nationalities

4. AVEX technical visits

AVEX Inc., a precision cutting and grinding manufacturer for small articles focusing on automotive components, was

founded in 1949. In 2004, the company started accepting factory tours for foreigners free of charge at the request of Japanese brokers operating travel agencies. Since 2008, AVEX Inc. has been offering a paid factory inspection and training service (hereinafter referred to as "AVEX Technical Visits") for foreigners. In 2015, the factory inspection and training service became an independent business provided by a separate company to focus on technical visits. As of 2017, the company received approximately 3,100 visitors annually and a cumulative total of about 15,000 visitors from more than 50 countries around the world. AVEX Inc. also won first prize at the 11th Industrial Tourism Town Development Award sponsored by the Japan Travel and Tourism Association. This indicates that AVEX Technical Visit is a successful example.

AVEX Technical Visits is part of the tour service organized and provided by Japanese brokers, who act as tour guides for visitors from abroad and offer package programs including tourism and industrial tourism.

The visit contents mainly consist of classroom learning and on-site training. Classroom lecturers and on-site trainers vary according to the schedule. Since interpreters are selected by Japanese brokers, the level of expert knowledge and communication skills varies from person to person.

5. Questionnaire survey

5.1 Preliminary survey

SERVPERF, an internationally renowned service quality evaluation scale used for research in various fields, was modified to design the questionnaire to evaluate the service. Specifically, after two visits (June 7 and November 18, 2016) to the factory of AVEX Inc. and confirming the essential elements for the technical visit field, the questions were modified based on a study conducted to evaluate service quality in fields such as tourism, IT, and retailing [Devinder, 2000; Masood, 2004; Hollis, 2007; Mohinder, 2014]. Table 1 shows the questionnaire items.

South Koreans and Chinese account for about 30 % of the foreign visitors to AVEX Inc.; the number of participants from these two countries is much higher than Germany, ranking third and accounting for 3 %. For this reason, visitors from South Korea and China were surveyed in this study. The preliminary questionnaire survey was conducted between February 15, 2017, and March 20, 2017, on 190 South Koreans and 126 Chinese who visited the AVEX Inc. Tado plant.

Table 1: Question items for preliminary survey

1.	Layout of factory and equipment are good
2.	Appearance of factory and equipment are clean
3.	Documents sych as mieruka and henkatenkanri are visually appealing
4.	Range of equipments and documents are many
5.	2S (seiri · seiton) are thorough
6.	Employees are neat appealing
7.	Staff`s sincerity in serving you
8.	Performance of service correctly
9.	Service provision in time
10.	Telling you exactly when services will be performed
11.	Staffs willingness to help you
12.	Atmosphere easy to question
13.	Staff`s knowledge and skills are sufficient
14.	Explanation is easy to understand
15.	Translation is easy to understand
16.	Factory is safety
17.	Company name and reputation are good
18.	Personal attention paid to you

The data obtained from the preliminary survey was analyzed to calculate the average score of each schedule, as shown in Figure 2, which confirms the visual difference in the average scores between Schedule A and other schedules. In order to clarify this difference, an interview was conducted with AVEX Inc. to carry out an exploratory analysis, which revealed that the staff team for Schedule A consisted of the staff in charge (general employees) and interpreters (without expert knowledge). This suggests that the evaluation of service quality is influenced by the staff team (staff in charge and interpreters). In addition, since the companies participating in the technical

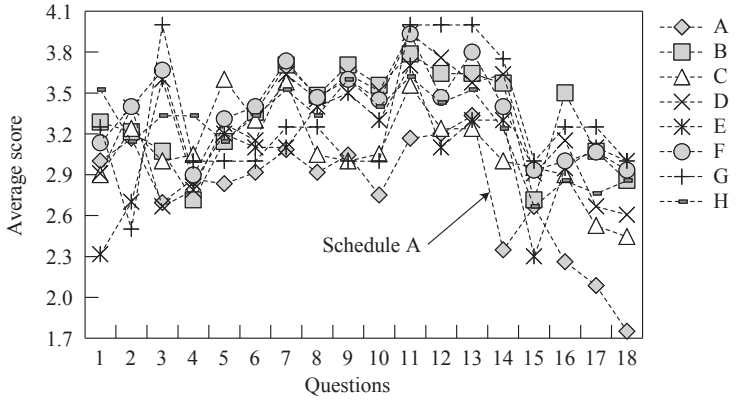

Figure 2: Average score by schedule (South Korea)

visit differ from one schedule to another, business types may also have influenced the evaluation. In the meantime, Schedules G and H turned out to have a staff team level close to that of Schedule A. The average score by official position revealed that the participation rate of the management team was high in Schedule A, whereas no employee in a management position participated in Schedules G and H. This suggests that the evaluation of service quality was also influenced by employees' positions.

5.2 Hypothetical model

The hypothetical model shown in Figure 3 was formulated based on the results of the preliminary survey described in the previous section and Zeithaml et al. [2006]. In order to confirm the impact of the observation variables of the staff team, official positions, and business type on the satisfaction level, paths from those to the satisfaction level were set. While the staff team is a situational factor, the official positions and business type are individual factors. The paths between latent variables and observation variables were named as shown in Figure 3. For example, the path from the staff team to the satisfaction level is called $p1$.

5.3 Main survey

To place the focus of the main survey on the details of the program of AVEX Technical Visit, the questionnaire was designed based on papers on the evaluation of service quality in the educational field [Rodney, 2006; Shekarchizadeh, 2011; Shpetim, 2012]. In addition, we visited AVEX Inc. (on July 5, 2017) and modified the SERVPERF questions to design a five-dimensional questionnaire with 20 questions. Two questions on the satisfaction level and loyalty were also added (See Table 2).

To grasp the characteristics of foreign visitors, the questionnaire included questions regarding their age, gender, educational background, official position, purpose of participation in the tour, business type, and staff team (classroom lecturer/interpreter and on-site trainer/interpreter).

The survey was conducted on South Korean and Chinese visitors at the AVEX Inc. Tado plant between August 8 and December 20, 2017. A total of 1,133 visitors (644 South Koreans and 489 Chinese) participated in the survey. Questionnaires with one or more missing or multiple answers to the questions regarding the staff team, the questionee's age, gender, official position, purpose of participation, and business type or to questions 1-22 were excluded from analysis. After excluding invalid answers, 652 completed questionnaires (452 from South Korea and 200 from China) were analyzed.

The highly efficient model SERVPERF was used for evaluation (post-evaluation only) to conduct the questionnaire survey in time-sensitive business situations. While seven dimensions are used for evaluation in SERVQUAL, since detailed scoring was not considered important in this research, five dimensions

Table 2: Question items for main survey

1.	Equipment is attractive
2.	Factory and equipment appearance are clean
3.	Documents during the factory are easy to understand
4.	Range of equipments and documents are abundance in your area of interest
5.	Staff are well dressed and neat in appearance
6.	Performance of the program is correct
7.	Program fees that offer good value for money
8.	High standard of lecture material
9.	Appropriate and manageable participants sizes
10.	Contents of the program are informed in advance
11.	Staff are always willing to help you
12.	Atmosphere is easy to question
13.	Valuable feedback from staff
14.	The behavior of staff instills confidence in you
15.	Staff are friendly and polite to you
16.	Staff has sufficient knowledge to answer your question
17.	Staff provide personal attention to you
18.	Staff understand your specific needs
19.	Staff understand your best interests
20.	Friendly environment with access to many opportunities for interaction with other participants
21.	Comprehensively satisfiy with this program
22.	Would like to recommend this program to your friends

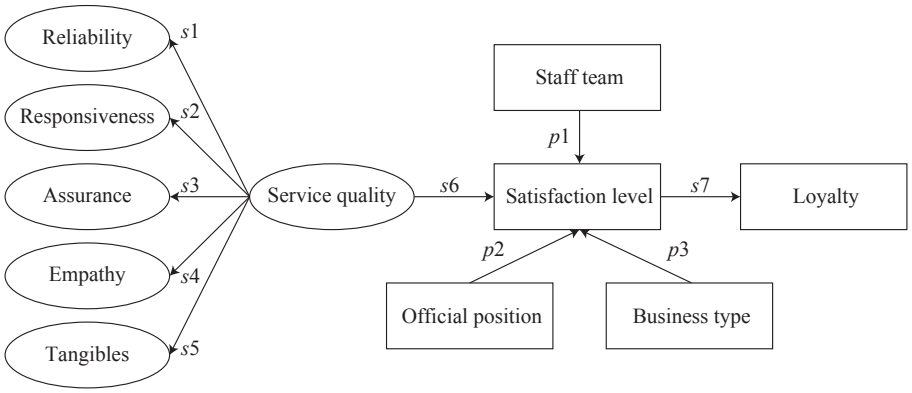

Figure 3: Hypothetical model

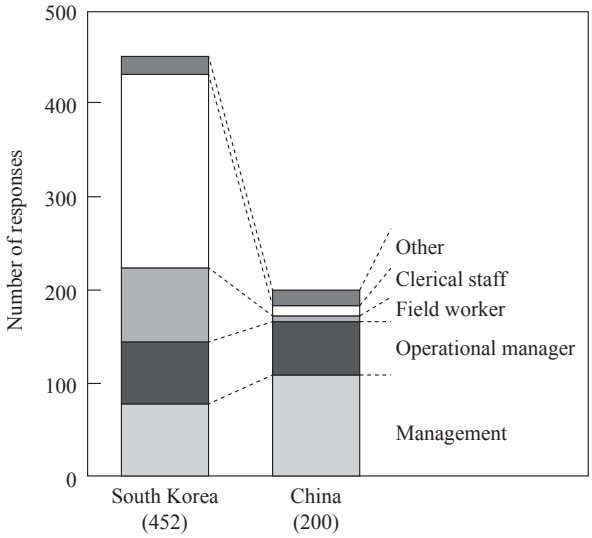

Figure 4: Breakdown by position in each country

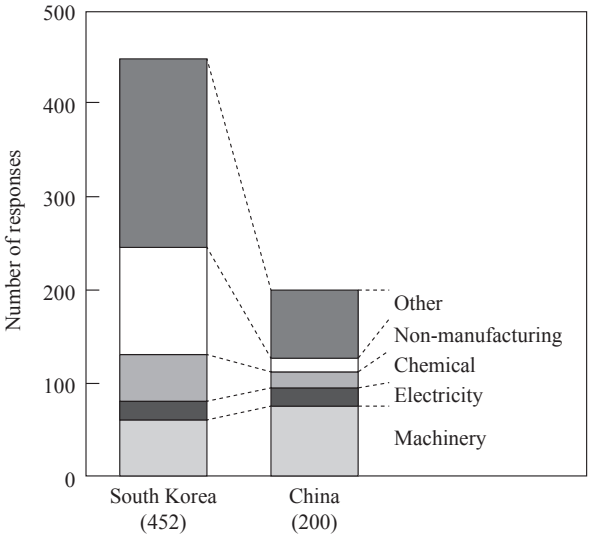

Figure 5: Breakdown by business type in each country

were used to simplify the survey.

Figure 4 indicates that non-managerial employees such as on-site workers and clerical staff account for 68 % of South Korean visitors, whereas employees in management positions, including members of management teams and site managers, account for 84 % of Chinese visitors. These characteristics of South Korean visitors may have been influenced by the fact that Company L, a major Korean enterprise, encourages its group companies to participate in tours that include AVEX Technical Visits on a regular basis.

According to Figure 5, while non-manufacturing businesses and other business types account for 71 % of the business types of South Korean visitors, the proportion of machinery is relatively high in the business types of Chinese visitors, accounting for 38 %. Other business types include IT and service-related businesses. The business type of South Korean visitors appears to be shifting from manufacturing to the service industry.

Table 3: Evaluation results of service quality

No.	Korea				China			
	α coefficient	Average		SD	α coefficient	Average		SD
1			4.30	0.664			4.33	0.673
2			4.56	0.637			4.59	0.570
3	0.80	4.38	4.27	0.687	0.78	4.42	4.31	0.705
4			4.24	0.709			4.39	0.655
5			4.54	0.581			4.51	0.576
6			4.47	0.604			4.50	0.601
7	0.79	4.25	4.30	0.683	0.86	4.42	4.30	0.680
8			4.09	0.763			4.40	0.625
9			4.16	0.797			4.48	0.617
10			4.18	0.744			4.52	0.642
11	0.83	4.45	4.58	0.546	0.85	4.56	4.56	0.591
12			4.54	0.589			4.60	0.593
13			4.49	0.608			4.56	0.591
14			4.57	0.563			4.61	0.565
15	0.86	4.64	4.71	0.476	0.83	4.62	4.74	0.496
16			4.65	0.522			4.50	0.618
17			4.54	0.581			4.52	0.609
18	0.85	4.4	4.45	0.635	0.87	4.43	4.47	0.641
19			4.39	0.642			4.38	0.677
20			4.21	0.808			4.34	0.766

6. Data analysis and discussion

6.1 Evaluation of service quality

The service quality of South Korea and China was evaluated to verify RQ1. Table 3 shows the evaluation results of service quality by South Korean and Chinese visitors. The alpha coefficient in each dimension of South Korea and China was about 0.8 or more. The internal consistency of the scale is generally considered to be high if the value is 0.7 or more. This suggests that the questions formulated represent properly the five dimensions of service quality.

The average scores of each dimension were 4.38 for tangibility, 4.25 for reliability, 4.45 for responsiveness, 4.64 for assurance, and 4.4 for empathy, with a high overall average score. This demonstrates that the service quality of AVEX Technical Visits is high. Consequently, AVEX seems to have already passed through the stage of focusing on improvement of its service quality. The company is expected to add value to the program and enhance its cooperative relationship with the local community by attracting foreign visitors to technical visits.

6.2 Multiple population analysis

6.2.1 Covariance structure analysis of multiple populations

Covariance structure analysis is characterized by the ability to represent complex relationships such as multiple regression analysis and factor analysis at once in a path diagram, and to analyze the relationship between various factors behind observation data. Multi-population analysis assumes that data has been extracted from multiple populations, and is capable of solving the problems of analysis by population such as inability to refer to differences in the model as a whole to data containing heterogeneous populations as well as the loss of stability of estimated values due to decrease in the number of samples at once.

The covariance structure analysis was conducted on the populations of South Korean and Chinese visitors to verify RQ2. The analysis of the data obtained based on $n = 652$ (South Korean: $n = 452$, China: $n = 200$) revealed the results below. Figures 6 and 7 indicate the results of the covariance structure analysis of hypothetical models of South Korean and Chinese participants (Goodness of fit index: chi-square = 1633, degrees of freedom = 540, significance probability = .000, GFI = .828, AGFI = .793, RMSEA = .056).

The goodness of fit index (GFI) and adjusted goodness of fit index (AGFI) indicate better fit when a value is closer to 1, and a value of .80 or more generally indicates high level of interpretability and acceptable model fit. The RMSEA index represents the deviation from the distribution of the model in a quantity per degree of freedom, and a value of 0.05 or less is generally considered indicative of an acceptable model fit. The obtained data largely met the standard of the indices, and the overall evaluation of the model indicated a relatively high level of interpretability and acceptable model fit.

6.2.2 Path analysis of multiple populations

Path analysis of multiple populations was performed to examine the differences between groups for each estimate value of the observed variables in the model. The model was analyzed for each group first to confirm the goodness of fit. The following results were obtained in the models of South Korea (Model 1) and China (Model 2).

- Model 1: GFI = .839, CFI = .887, RMSEA = .077
- Model 2: GFI = .806, CFI = .882, RMSEA = .083

As indicated by the results, both models demonstrated an acceptable fit.

The configural invariance of the models was examined next. Configural invariance is the hypothesis that estimated values may differ between groups even when the path diagrams are the same, due to the lack of equality constraints. The following results were obtained from the combination of the models of South Korea and China (Model 3).

- Model 3: GFI = .828, CFI = .885, RMSEA = .056

This confirmed the goodness of fit of the model and the existence of configural invariance.

Once the configural invariance of the model was confirmed,

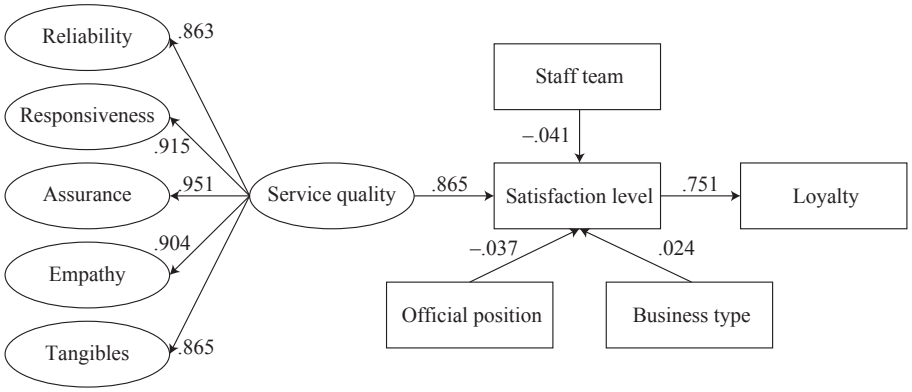

Figure 6: Results of covariance structure analysis of hypothetical model (South Korea)

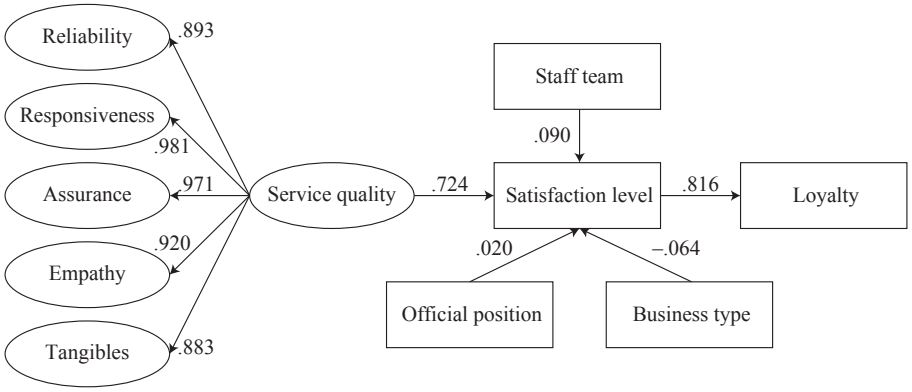

Figure 7: Results of covariance structure analysis of hypothetical model (China)

the differences in each estimate value of the model between groups was examined. When the variable names of South Korea and China are set as K and C, Kp1, for example, represents the path from the Korean staff team to the satisfaction level. The results of a paired comparison of the parameters indicated 5 % of regional heterogeneity with the pass coefficient *p*1 in Figure 3. However, this information alone can only refer to the regional heterogeneity of the group. Therefore, in order to confirm the goodness of fit in the entire model, simultaneous analysis was performed on p1 with equality constraints. An analysis of the model with no constraints (Model 4) and with constraints: Kp1 = Cp1 (Model 5) indicated the following results:

- Model 4: GFI = .828, CFI = .885, RMSEA = .056
- Model 5: GFI = .828, CFI = .884, RMSEA = .056

A comparison of these model fits indicates that the goodness of fit of Model 4 with no constraints is slightly better. This suggests that the difference in staff teams between groups affects the satisfaction level in the model as a whole. In contrast, differences in positions and business types between groups have no influence on the satisfaction level.

Based on the above results, an exploratory analysis was conducted focusing on the data of the staff teams. Figure 8 indicates that while 95 % of the interpreters for South Korean visitors were experienced professionals, the interpreter team for Chinese visitors consisted of 53 % experienced interpreters, 21 % mid-level interpreters, and 11 % novice interpreters. This suggests that the difference between groups is caused by the variation in the level of interpreters.

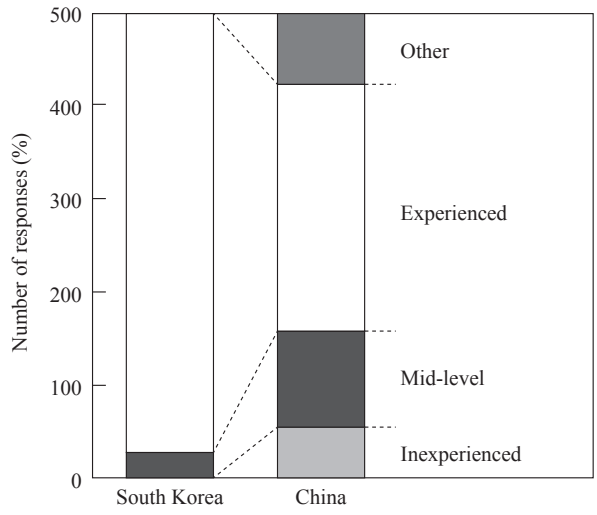

Figure 8: Breakdown of interpreters for each country

6.2.3 Average structure analysis of multiple populations

An average structure analysis of multiple populations was conducted on the two populations to verify the RQ3. In order to compare the differences in averages of latent variables, it is necessary to establish measurement invariance on the equality of latent variable patterns between the populations. An analysis of the configural invariance model (Model 6) and measurement invariance model, Ks1-6 = Cs1-6, K1-20 = C1-20 (Model 7), revealed the following results:

- Model 6: RMSEA = .056, AIC = 1839
- Model 7: RMSEA = .055, AIC = 1841

The indices of the two models suggested that it was appropriate to adopt Model 7 and confirmed the existence of measurement invariance.

Based on these results, an average structure was introduced to compare the average of latent variables. Two processes are required to make the comparison. The first is to equalize the values of the intercepts of observed variables to obtain the difference in the average of latent variables. The intercepts of all observed variables were set to 0 to estimate the average by an analysis of paths between latent variables. The second process is to fix the average and variance values of latent variables in one population. For this research, the average and variance of South Korea were fixed respectively at 0 and 1, whereas the average and variance of China were set respectively as Fm2 and Fv2. Based on the fixed Korean population, its comparison with the Chinese population enables the examination of the difference in the average of latent variables in the populations.

Table 4: Model fit results

Model	Parameter constraints	AIC	CFI	RMSEA
Model 8	$Fm2 = 0$, $Fv2 = 1$	6640	.381	.119
Model 9	$Fv2 = 1$	6531	.393	.118
Model 10	$Fm2 = 0$	6306	.417	.116
Model 11	None	5828	.468	.111

Since this model is a measurement invariance model, path diagrams were drawn so as to equalize the latent variable patterns in both groups. Here, we consider a combination of the case of fixed average and variance and that of estimations, in the latent variable of China where the average and variance are not fixed. The results shown in Table 4 were obtained in an analysis of the models with "average: 0, variance: 1 (Model 8)," "average estimate, variance: 1 (Model 9)," "average: 0, variance estimate (Model 10)," and "average estimate, variance estimate (Model 11)." The goodness of fit index indicated that Model 11 was the best fit.

The estimation results of Model 11 were average = 0.4 and variance = 0.20. The effect amount d based on the standard deviation was evaluated using this estimated value to calculate the difference. The solution of the equation (1) shows $d = -0.44$, indicating that the evaluation of service quality by Chinese visitors is about 0.44 higher than that of Korean visitors. There is a difference of about 4 when the figure is converted to a deviation value, and this difference is significant. This suggests a difference in the evaluation of service quality between Korean and Chinese visitors.

$$d = \frac{Fm1 - Fm2}{S^*} \cdots (1) \text{ with } S^* = \sqrt{\frac{n1Fv1 + n2Fv2}{n1 + n2 - 2}}$$

7. Conclusion

This research was conducted to evaluate the service quality of the technical visits organized by AVEX Inc. for foreign visitors. For RQ1, high average scores were obtained in the five dimensions, namely, tangibility, reliability, responsiveness, assurance, and empathy, by both South Korean and Chinese visitors. This revealed that the service quality of technical visits was high. In relation to RQ2, the covariance structure analysis of multiple populations in a hypothetical model confirmed the validity of the satisfaction model of Zeithaml et al. [2006] in the field of technical visits. At the same time, the path analysis of multiple populations demonstrated that differences between the staff teams of different groups influenced the level of satisfaction. An average structure analysis of multiple populations was performed to solve RQ3, which indicated the existence of a difference in the evaluation of service quality between South Korean and Chinese visitors. This confirmed in the area of technical visits the difference in evaluation of service quality in different nationalities pointed out by Rodney et al. [2006].

Based on the results above, in the globally growing travel market, technical visits are expected to become a pillar of Japan's future tourism strategy. Since the research indicated that visitors' positions and business types had no confirmed influence on satisfaction levels, it will be possible to provide a generalized program even if the customer segment participating in technical visits changes in the future. Nevertheless, it is necessary to take into account the nationalities of foreign visitors. In addition, as differences in staff teams, especially interpreters, turned out to have an impact on the degree of satisfaction, it is important to improve their level.

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