Bayesian Network Analysis for the Questionnaire Investigation on the Impression at Fuji City

Daisuke Suzuki[1], Akane Okubo[2], Tsuyosi Aburai[3] & Kazuhiro Takeyasu[4]

[1] Fujisan Area Management Company, Japan

[2] NIHON University Junior College, Japan

[3] Tokushima University, Japan

4 College of Business Administration, Tokoha University, Japan

Correspondence: Kazuhiro Takeyasu, College of Business Administration, Tokoha University, Japan.

Abstract

Shopping streets at local city in Japan became old and are generally declining. In this paper, we handle the area rebirth and/or regional revitalization of shopping street. We focus on Fuji city in Japan. Four big festivals are held at Fuji city. Many people visit these festivals including residents in that area. Therefore a questionnaire investigation to the residents and visitors is conducted during these periods in order to clarify residents and visitors' needs for the shopping street, and utilize them to the plan building of the area rebirth and/or regional revitalization of shopping street. In this paper, we mainly focus the impression the visitors feel and analyze them. These are analyzed by using Bayesian Network. The analysis utilizing Bayesian Network enabled us to visualize the causal relationship among items. Furthermore, sensitivity analysis brought us estimating and predicting the prospective visitors. These are utilized for constructing a much more effective and useful plan building. We have obtained fruitful results. To confirm the findings by utilizing the new consecutive visiting records would be the future works to be investigated.

Keywords: Fuji city, area rebirth, regional vitalization, festival, Bayesian network

1. Introduction

Shopping streets at local city in Japan are generally declining. It is because most of them were built in the so-called "High Growth Period (1954-1973)". Therefore they became old and area rebirth and/or regional revitalization are required everywhere.

There are many papers published concerning area rebirth or regional revitalization. Inoue (2017) has pointed out the importance of tourism promotion. Ingu et al. (2017) developed the project of shutter art to Wakkanai Chuo shopping street in Hokkaido, Japan. Ohkubo (2017) has made a questionnaire research at Jigenji shopping street in Kagoshima Prefecture, Japan and analyzed the current condition and future issues. For about tourism, many papers are presented from many aspects as follows.

Yoshida et al. designed and conducted a visitor survey on the spot, which used a questionnaire to investigate the activities of visitors to the Ueno district in Taito ward, Tokyo. Doi et al. analyzed the image of the Izu Peninsula as a tourist destination in their 2003 study "Questionnaire Survey on the Izu Peninsula." Kano conducted tourist behavior studies in Atami city in 2008, 2009, 2014 and in other years.

In this paper, we handle the area rebirth and/or regional revitalization of shopping street. We focus on Fuji city in Japan. Fuji city is located in Shizuoka Prefecture. Mt. Fuji is very famous all around the world and we can see its beautiful scenery from Fuji city, which is at the foot of Mt. Fuji. There are two big shopping street in Fuji city. One is Yoshiwara shopping street and another one is Fuji shopping street. They became old and building area rebirth and regional revitalization plan have started. Following investigation was conducted by the joint research group (Fuji Chamber of Commerce & Industry, Fujisan Area Management Company, Katsumata Maruyama Architects, Kougakuin University and Tokoha University). The main project activities are as follows.

A.　Investigation on the assets which are not in active use

B.　Questionnaire Investigation to Entrepreneur

C. Questionnaire Investigation to the residents and visitors

After that, area rebirth and regional revitalization plan were built.

In this paper, we handle above stated C.

Four big festivals are held at Fuji city. Two big festivals are held at Yoshiwara district (Yoshiwara shopping street) and two big festivals at Fuji district (Fuji shopping street).

At Yoshiwara district, Yoshiwara Gion Festival is carried out during June and Yoshiwara Shukuba (post-town) Festival is held during October. On the other hand, Kinoene Summer Festival is conducted during August and Kinoene Autumn Festival is performed during October at Fuji district. Many people visit these festivals including residents in that area.

Therefore questionnaire investigation of C is conducted during these periods.

Finally, we have obtained 982 sheets (Yoshiwara district: 448, Fuji district: 534).

Basic statistical analysis and Bayesian Network analysis are executed based on that.

In this paper, a questionnaire investigation is executed in order to clarify residents and visitors' needs for the shopping street, and utilize them to the plan building of the area rebirth and/or regional revitalization of shopping street. In this paper, we mainly focus the impression the visitors feel and analyze them. These are analyzed by using Bayesian Network. By that model, the causal relationship is sequentially chained by the characteristics of visitors, the purpose of visiting and the image of the surrounding area at this shopping street. The analysis utilizing Bayesian Network enabled us to visualize the causal relationship among items. Furthermore, sensitivity analysis brought us estimating and predicting the prospective visitors.

Some interesting and instructive results are obtained.

The rest of the paper is organized as follows. Outline of questionnaire investigation is stated in section 2. In section 3, Bayesian Network analysis is executed which is followed by the sensitivity analysis in section 4. Remarks are stated in section 5.

2. Outline and the Basic Statistical Results of the Questionnaire Research

2.1 Outline of the Questionnaire Research

A questionnaire investigation to the residents and visitors is conducted during these periods in order to clarify residents and visitors' needs for the shopping street, and utilize them to the plan building of the area rebirth and/or regional revitalization of shopping street. The outline of questionnaire research is as follows. Questionnaire sheet is attached in Appendix 1.

(1)	Scope of investigation	:	Residents and visitors who have visited four big festivals at Fuji city in Shizuoka Prefecture, Japan
(2)	Period	:	Yoshiwara Gion Festival: June 11,12/2016
			Yoshiwara Shukuba (post-town) Festival: October 9/2016
			Kinoene Summer Festival: August 6,7/2016
			Kinoene Autumn Festival: October 15,16/2016
(3)	Method	:	Local site, Dispatch sheet, Self writing
(4)	Collection	:	Number of distribution 1400
			Number of collection 982(collection rate 70.1%)
			Valid answer 982

2.2 Basic Statistical Results

Now, we show the main summary results by single variable.

2.2.1 Characteristics of Answers

(1) Sex (Q7)

Male 48.9%, Female 51.1%

These are exhibited in Figure 1.
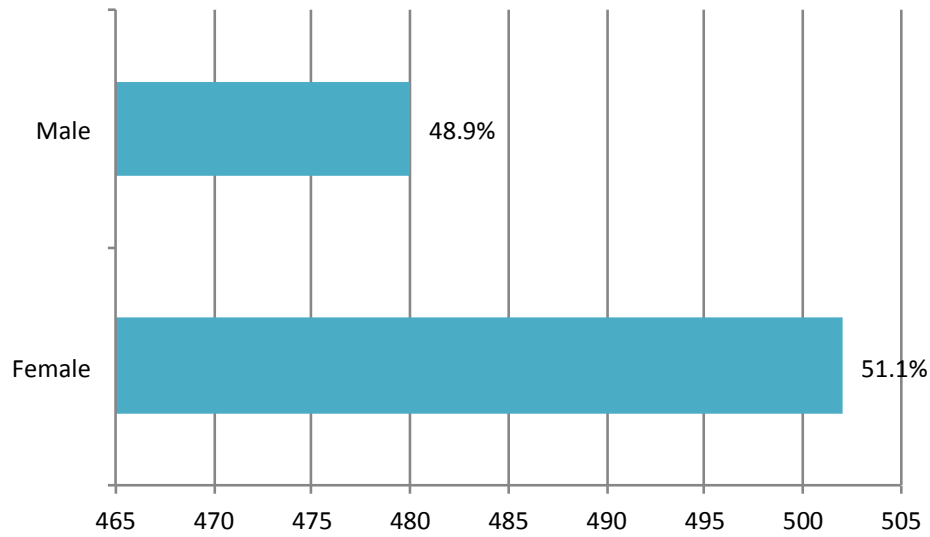
Figure 1. Sex (Q7)

(2)   Age (Q8)

10th 16.2%, 20th 14.8%, 30th 22.4%, 40th 17.4%, 50th 11.6%, 60th 10.5%, More than 70 7.1%

These are exhibited in Figure 2.
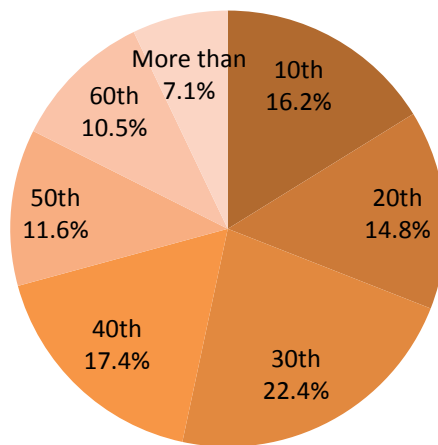
Figure 2. Age (Q8)

(3) Residence (Q9)

a. Fuji city 56.4%, b. Fujinomiya city 18.0%, c. Numazu city 7.2%, d. Mishima city 2.3%, e. Shizuoka city 4.2%, F. Else (in Shizuoka Prefecture) 5.1%, g. Outside of Shizuoka Prefecture 6.9%

These are exhibited in Figure 3.
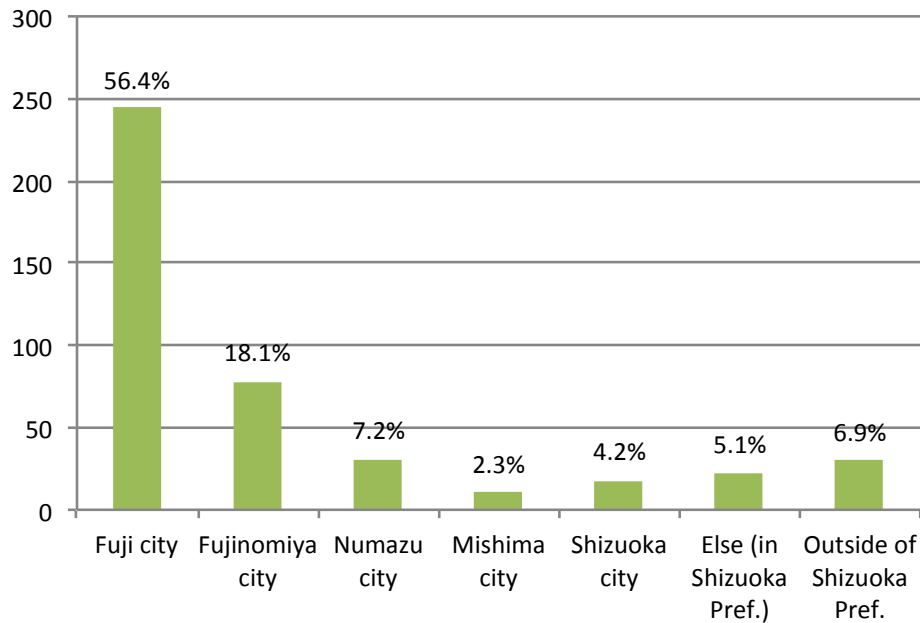
Figure 3. Residence (Q9)

(4) How often do you come to this shopping street? (Q1)

Everyday 17.4%, More than 1 time a week 16.5%, More than 1 time a month 25.8%,

More than 1 time a year 31.6%, First time 4%, Not filled in 4.8%

These are exhibited in Figure 4.
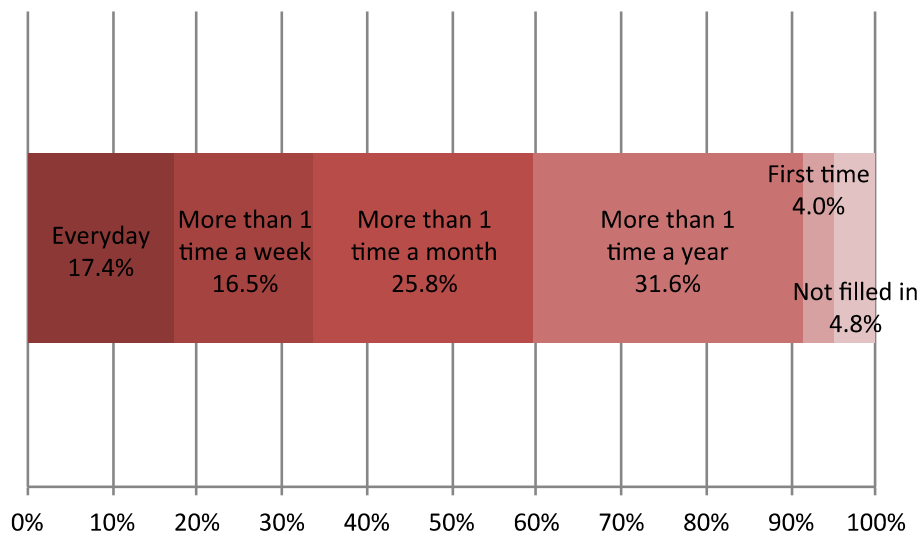
Figure 4. How often do you come to this shopping street? (Q1)

(5) What is the purpose of visiting here? (Q2)

Shopping 18.8%, Eating and drinking 13.4%, Business 7.4%, Celebration, event 40.2%,

Leisure, amusement 4.0%, miscellaneous 16.1%

These are exhibited in Figure 5.
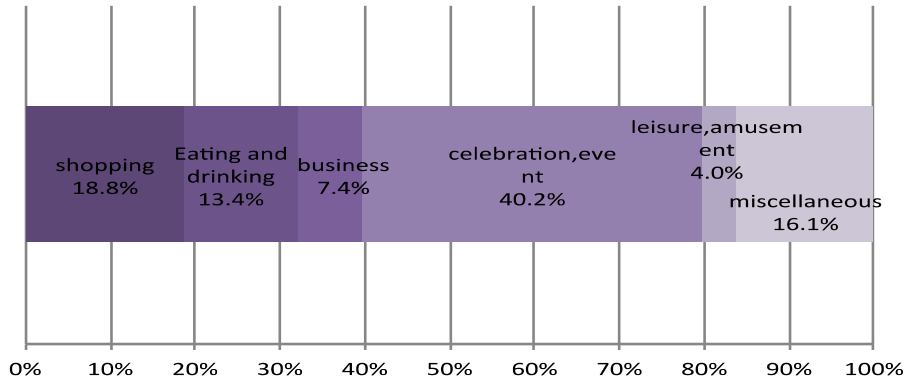
Figure 5. What is the purpose of visiting here? (Q2)

(6) How do you feel about the image of the surrounding area at this shopping street? (Q3)

These are exhibited in Figure 6.
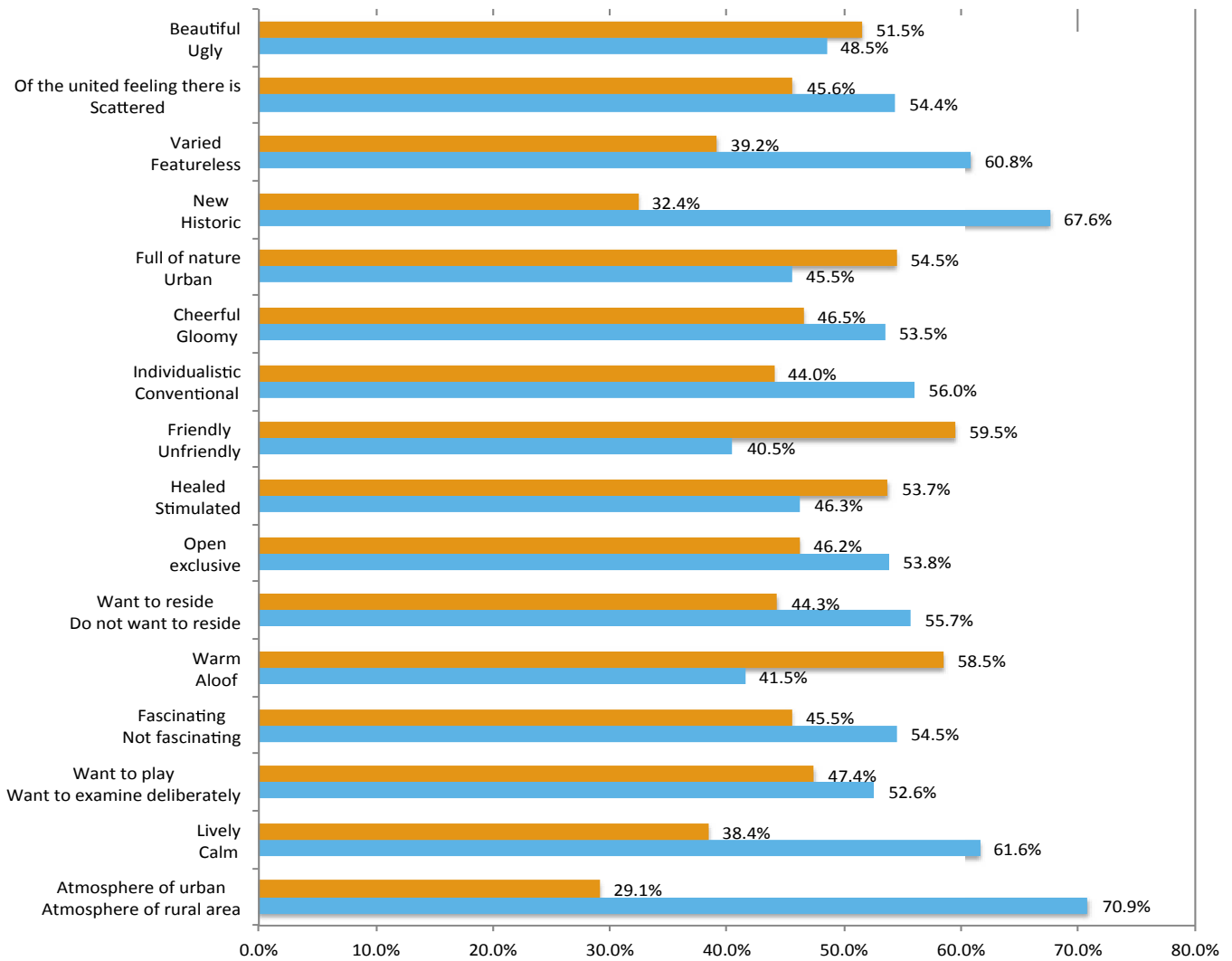
Figure 6. How do you feel about the image of the surrounding area at this shopping street? (Q3)

(7)   There are many old building at the age of nearly 50 years. Do you think we can still use them? (Q4). Can use it 44.1%, Cannot use it 31.4%, Have no idea 24.5%. These are exhibited in Figure 7.
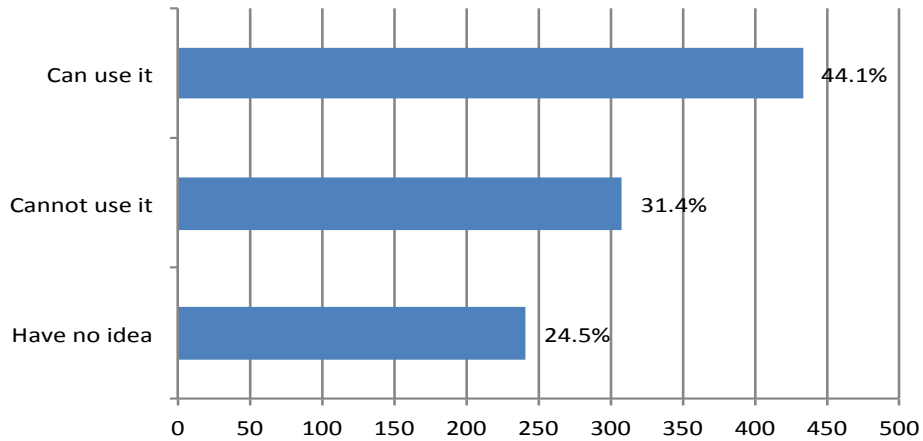
Figure 7. There are many old building at the age of nearly 50 years. Do you think we can still use them? (Q4)

3. Bayesian Network Analysis

In constructing Bayesian Network, it is required to check the causal relationship among groups of items.

Based on this, a model is built as is shown in Figure 8.
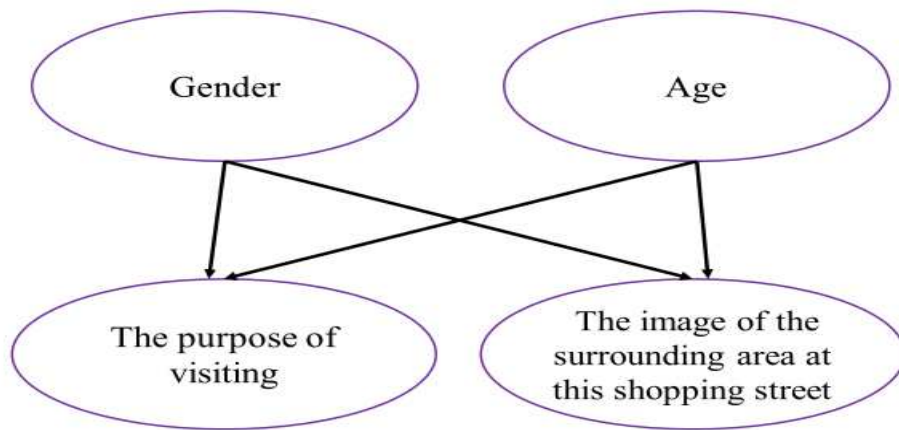
Figure 8. A built model

We used BAYONET software (http://www.msi.co.jp/BAYONET/). When plural nodes exist in the same group, it occurs that causal relationship is hard to set a priori. In that case, BAYONET system set the sequence automatically utilizing AIC standard. Node and parameter of Figure 8 are exhibited in Table 1.

Table 1. Node and parameter

Node	Parameter									
	1	2	3	4	5	6	7	8	9	10
Gender	Male	Female								
Age	10th	20th	30th	40th	50th	60th	More than 70			
The purpose of visiting	Shopping	Eating and drinking	Business	Celebration event	Leisure, amusement	miscellaneous				
The image of the surrounding area at this shopping street	Beautiful	Ugly	Of the united feeling there is	Scattered	Varied	Feature less	New	Historic	Full of nature	Urban

Node	Parameter									
	11	12	13	14	15	16	17	18	19	20
The image of the surrounding area at this shopping street	Cheerful	Gloomy	Individualistic	Conventional	Friendly	Unfriendly	Healed	Stimulated	Open	Exclusive

Node	Parameter									
	21	22	23	24	25	26	27	28	29	30
The image of the surrounding area at this shopping street	Want to reside	Do not want to reside	Warm	Aloof	Fascinating	Not fascinating	Want to play	Want to examine deliberately	Lively	Calm

Node	Parameter	
	31	32
The image of the surrounding area at this shopping street	Atmosphere of urban	Atmosphere of rural area

4. Sensitivity Analysis

Now, posterior probability is calculated by setting evidence as, for example, 1.0. Comparing Prior probability and Posterior probability, we can seek the change and confirm the preference or image of the surrounding area at this shopping street. We set evidence to all parameters. Therefore the analysis volume becomes too large. In this paper, we focus on "The image of the surrounding area at this shopping street" and pick up latter half and make sensitivity analysis. We prepare another paper for the rest of them.

As stated above, we set evidence for each parameter, and the calculated posterior probability is exhibited in Appendix 2. The value of "Posterior probability-Prior probability" (we call this "Difference of probability" hereafter) is exhibited in Appendix 3. The sensitivity analysis is executed by mainly using this table.

Here, we classify each item by the strength of the difference of probability.

・Strong (++,－－): Select major parameter of which absolute value of difference of probability is more than 0.05

・Medium (+,－): Select major parameter of which absolute value of difference of probability is more than 0.01

・Weak: Else

In selecting items, negative value does not necessarily have distinct meaning, therefore we mainly pick up positive value in the case meaning is not clear.

Now we examine each for Strong and Medium case.

4.1 Sensitively Analysis for "The Image of the Surrounding Area at This Shopping Street"

(1) Setting evidence to "Healed"

After setting evidence to "Healed", the result is exhibited in Table 2.

Table 2. Setting evidence to "Healed" case

Of the united feeling there is	+
Scattered	−
Cheerful	+
Individualistic	+
Friendly	+
Unfriendly	−
Open	+
Fascinating	+
Want to play	+
Lively	+
Age: 10th	++
Age: 20th	++
Age: 40th	−
Age: 50th	−−
Age: 60th	−−
Age: More than 70	−−

We can observe that "Those who have an image of the surrounding area at this shopping street as "Healed" had come under the image of the surrounding area at this shopping street as "Of the united feeling there is", "Cheerful", "Individualistic", "Friendly", "Open", "Fascinating", "Want to play" or "Lively" of an age of "**10th**" or "**20th**".

(Strong part is indicated by bold font.)

(2) Setting evidence to "Stimulated"

After setting evidence to "Stimulated", the result is exhibited in Table 3.

Table 3. Setting evidence to "Stimulated" case

Want to play	−
Age: 10th	−−
Age: 20th	−
Age: 30th	−
Age: 50th	−−
Age: More than 70	−

There were only weak positive items.

(3) Setting evidence to "Open"

After setting evidence to "Open", the result is exhibited in Table 4.

Table 4. Setting evidence to "Open" case

Of the united feeling there is	+
Fascinating	+
Want to play	+
Lively	+
Male	+
Female	−
Age: 10th	++
Age: 20th	+
Age: 50th	−−
Age: More than 70	−

We can observe that "Those who have an image of the surrounding area at this shopping street as "Open" had come under the image of the surrounding area at this shopping street as "Of the united feeling there is", "Fascinating", "Want to play" or "Lively" of an age of "**10th**"or "20th" in which the gender is "Male".

(4) Setting evidence to "Exclusive"

After setting evidence to "Exclusive", the result is exhibited in Table 5.

Table 5. Setting evidence to "Exclusive" case

Shopping	+
Individualistic	−
Friendly	−
Unfriendly	+
Fascinating	−
Want to play	−
Lively	−
Atmosphere of urban	−
Male	−
Female	+
Age: 10th	− −
Age: 20th	+ +
Age: 40th	+
Age: 50th	+
Age: 60th	+
Age: More than 70	+ +

We can observe that "Those who have an image of the surrounding area at this shopping street as "Exclusive" had come with the purpose of visiting for "Shopping" under the image of the surrounding area at this shopping street as "Unfriendly" of an age of "**20th**", "40th","50th", "60th" or "**More than 70**" in which the gender is "Female".

(5) Setting evidence to "Want to reside"

After setting evidence to "Want to reside", the result is exhibited in Table 6.

Table 6. Setting evidence to "Want to reside" case

Age: 10th	+
Age: 20th	+
Age: 30th	−
Age: 50th	−
Age: 60th	−
Age: More than 70	+ +

We can observe that "Those who have an image of the surrounding area at this shopping street as "Want to reside" had come by an age of "10th","20th" or "**More than 70**".

(6) Setting Evidence to "Do not want to reside"

After setting evidence to "Do not want to reside", the result is exhibited in Table 7.

Table 7. Setting evidence to "Do not want to reside" case

Male	$+$
Female	$-$
Age: 20th	$--$
Age: 30th	$-$
Age: 40th	$+$
Age: 50th	$--$
Age: 60th	$++$
Age: More than 70	$-$

We can observe that "Those who have an image of the surrounding area at this shopping street as "Do not want to reside" had come by an age of "40th" or "**60th**" in which the gender is "Male".

(7) Setting Evidence to "Warm"

After setting evidence to "Warm", the result is exhibited in Table 8.

Table 8. Setting evidence to "Warm" case

Eating and drinking	$-$
Of the united feeling there is	$+$
Individualistic	$+$
Fascinating	$+$
Want to play	$+$
Male	$-$
Female	$+$
Age: 10th	$++$
Age: 30th	$-$
Age: 50th	$--$
Age: 60th	$-$
Age: More than 70	$-$

We can observe that "Those who have an image of the surrounding area at this shopping street as "Warm" had come under the image of the surrounding area at this shopping street as "Of the united feeling there is", "Individualistic", "Fascinating" or "Want to play" of an age of "**10th**" in which the gender is "Female".

(8) Setting evidence to "Aloof"

After setting evidence to "Aloof", the result is exhibited in Table 9.

Table 9. Setting evidence to "Aloof" case.

Male	$+$
Female	$-$
Age: 10th	$--$
Age: 30th	$-$
Age: 40th	$+$
Age: 50th	$++$
Age: 60th	$+$
Age: More than 70	$-$

We can observe that "Those who have an image of the surrounding area at this shopping street as "Aloof" had come by an age of "40th", "**50th**" or "60th" in which the gender is "Male".

(9) Setting evidence to "Fascinating"

After setting evidence to "Fascinating", the result is exhibited in Table 10.

Table 10. Setting evidence to "Fascinating" case

Eating and drinking	−
Beautiful	+
Of the united feeling there is	+
Scattered	−
Varied	+
Cheerful	+
Individualistic	+
Friendly	+
Unfriendly	−
Healed	+
Stimulated	−
Open	+
Want to play	+
Lively	+
Atmosphere of urban	+
Age: 10th	＋＋
Age: 20th	＋＋
Age: 40th	−
Age: 50th	−−
Age: 60th	−−

We can observe that "Those who have an image of the surrounding area at this shopping street as "Fascinating" had come under the image of the surrounding area at this shopping street as "Beautiful", "Of the united feeling there is", "Varied"," Cheerful", "Individualistic", "Friendly", "Healed", "Open" "Want to play", "Lively" or "Atmosphere of urban" of an age of "**10th**" or "**20th**".

(10) Setting evidence to "Not fascinating"

After setting evidence to "Not fascinating", the result is exhibited in Table 11.

Table 11. Setting evidence to "Not fascinating" case

Of the united feeling there is	−
Cheerful	−
Individualistic	−
Want to play	−
Lively	−
Age: 10th	−−
Age: 20th	−
Age: 30th	+
Age: 50th	+
Age: 60th	＋＋
Age: More than 70	+

We can observe that "Those who have an image of the surrounding area at this shopping street as "Not fascinating" had come by an age of "30th", "50th", "**60th**", or "More than 70".

(11) Setting evidence to "Want to play"

After setting evidence to "Want to play", the result is exhibited in Table 12.

Table 12. Setting evidence to "Want to play" case

Eating and drinking	−
Of the united feeling there is	+
Scattered	−
Cheerful	+
Gloomy	−
Individualistic	+
Conventional	−
Friendly	+
Unfriendly	−
Healed	+
Stimulated	−
Open	+
Fascinating	+
Not fascinating	−
Lively	+
Atmosphere of urban	+
Age: 10th	+
Age: 20th	+ +
Age: 40th	+
Age: 50th	− −
Age: 60th	− −
Age: More than 70	− −

We can observe that "Those who have an image of the surrounding area at this shopping street as "Want to play" had come under the image of the surrounding area at this shopping street as "Of the united feeling there is", "Cheerful", "Individualistic", "Friendly", "Healed", "Open", "Fascinating", "Lively" or "Atmosphere of urban" of an age of "10th", "20th" or "40th".

(12) Setting evidence to "Want to examine deliberately"

After setting evidence to "Want to examine deliberately", the result is exhibited in Table 13.

Table 13. Setting evidence to "Want to examine deliberately" case

Shopping	+
Leisure, amusement	+
Stimulated	+
Lively	−
Atmosphere of urban	−
Male	−
Female	+
Age: 10th	− −
Age: 20th	+
Age: 30th	− −
Age: 50th	− −
Age: 60th	+ +
Age: More than 70	+ +

We can observe that "Those who have an image of the surrounding area at this shopping street as "Want to examine deliberately" had come with the purpose of visiting for "Shopping" or "Leisure, amusement" under the image of the surrounding area at this shopping street as "Stimulated" of an age of "20th", "**60th**" or "**More than 70**" in which the gender is "Female".

(13) Setting evidence to "Lively"

After setting evidence to "Lively", the result is exhibited in Table 14.

Table 14. Setting evidence to "Lively" case

Of the united feeling there is	+
Scattered	−
Varied	+
Cheerful	+
Individualistic	+
Friendly	+
Unfriendly	−
Healed	+
Open	+
Fascinating	+
Want to play	+
Atmosphere of urban	+
Male	+
Female	−
Age: 10th	+ +
Age: 20th	+ +
Age: 30th	−
Age: 40th	− −
Age: 50th	−
Age: 60th	− −
Age: More than 70	−

We can observe that "Those who have an image of the surrounding area at this shopping street as "Lively" had come under the image of the surrounding area at this shopping street as "Of the united feeling there is", "Varied", "Cheerful", "Individualistic", "Friendly", "Healed", "Open", "Fascinating", "Want to play", or "Atmosphere of urban" of an age of "10th" or "20th" in which the gender is "Male".

(14) Setting evidence to "Calm"

After setting evidence to "Calm", the result is exhibited in Table 15.

Table 15. Setting evidence to "Calm" case

Shopping	+
Leisure, amusement	+
Of the united feeling there is	−
Scattered	+
Cheerful	−
Individualistic	−
Unfriendly	+
Healed	−
Stimulated	+
Fascinating	−
Want to play	−
Want to examine deliberately	+
Atmosphere of urban	−
Male	−
Female	+
Age: 10th	− −
Age: 20th	−
Age: 30th	−
Age: 40th	+
Age: 50th	+
Age: 60th	+ +
Age: More than 70	+ +

We can observe that "Those who have an image of the surrounding area at this shopping street as "Calm" had come with the purpose of visiting for "Shopping" or "Leisure, amusement" under the image of the surrounding area at this

shopping street as "Scattered", "Unfriendly"," Stimulated" or "Want to examine deliberately" of an age of "40th", "50th", "**60th**" or "**More than 70**" in which the gender is "Female".

(15) Setting evidence to "Atmosphere of urban"

After setting evidence to "Atmosphere of urban", the result is exhibited in Table 16.

Table 16. Setting evidence to "Atmosphere of urban" case

Male	$+$
Female	$-$
Age: 10th	$++$
Age: 20th	$-$
Age: 50th	$-$
Age: 60th	$--$
Age: More than 70	$+$

We can observe that "Those who have an image of the surrounding area at this shopping street as "Atmosphere of urban" had come by an age of "**10th**" or "More than 70" in which the gender is "Male".

(16) Setting evidence to "Atmosphere of rural area"

After setting evidence to "Atmosphere of rural area", the result is exhibited in Table 17.

Table 17. Setting evidence to "Atmosphere of rural area" case

Leisure, amusement	$+$
Of the united feeling there is	$-$
Scattered	$+$
Cheerful	$-$
Individualistic	$-$
Healed	$-$
Stimulated	$+$
Fascinating	$-$
Want to play	$-$
Want to examine deliberately	$+$
Lively	$-$
Male	$-$
Female	$+$
Age: 10th	$--$
Age: 20th	$-$
Age: 50th	$++$
Age: 60th	$++$
Age: More than 70	$+$

We can observe that "Those who have an image of the surrounding area at this shopping street as "Atmosphere of rural area" had come with the purpose of visiting for "Leisure, amusement" under the image of the surrounding area at this shopping street as "Scattered", "Stimulated" or "Want to examine deliberately" of an age of "**50th**", "**60th**" or "More than 70" in which the gender is "Female".

5. Remarks

The Results for Bayesian Network Analysis are as follows.

In the Bayesian Network Analysis, model was built under the examination of the causal relationship among items. Sensitively Analysis was conducted after that. The main result of sensitively analysis is as follows.

We can observe that "Those who have an image of the surrounding area at this shopping street as "Healed" had come under the image of the surrounding area at this shopping street as "Of the united feeling there is", "Cheerful",

"Individualistic", "Friendly", "Open", "Fascinating", "Want to play" or "Lively" of an age of "**10th**" or"**20th**".

We can observe that "Those who have an image of the surrounding area at this shopping street as "Fascinating" had come under the image of the surrounding area at this shopping street as "Beautiful", "Of the united feeling there is", "Varied"," Cheerful", "Individualistic", "Friendly", "Healed", "Open" "Want to play", "Lively" or "Atmosphere of urban" of an age of "**10th**" or "**20th**".

We can observe that "Those who have an image of the surrounding area at this shopping street as "Want to play" had come under the image of the surrounding area at this shopping street as "Of the united feeling there is", "Cheerful", "Individualistic", "Friendly", "Healed", "Open", "Fascinating", "Lively" or "Atmosphere of urban" of an age of "10th", "**20th**" or "40th".

We can observe that "Those who have an image of the surrounding area at this shopping street as "Lively" had come under the image of the surrounding area at this shopping street as "Of the united feeling there is", "Varied", "Cheerful", "Individualistic", "Friendly", "Healed", "Open", "Fascinating", "Want to play", or "Atmosphere of urban" of an age of "**10th**" or "**20th**" in which the gender is "Male".

We can observe that "Those who have an image of the surrounding area at this shopping street as "Calm" had come with the purpose of visiting for "Shopping" or "Leisure, amusement" under the image of the surrounding area at this shopping street as "Scattered", "Unfriendly"," Stimulated" or "Want to examine deliberately" of an age of "40th", "50th", "**60th**" or "**More than 70**" in which the gender is "Female".

We can observe that "Those who have an image of the surrounding area at this shopping street as "Atmosphere of rural area" had come with the purpose of visiting for "Leisure, amusement" under the image of the surrounding area at this shopping street as "Scattered", "Stimulated" or "Want to examine deliberately" of an age of "**50th**", "**60th**" or "More than 70" in which the gender is "Female".

6. Conclusion

Shopping streets at local city in Japan became old and are generally declining. In this paper, we handle the area rebirth and/or regional revitalization of shopping street. We focus on Fuji city in Japan. Four big festivals are held at Fuji city. Many people visit these festivals including residents in that area. Therefore a questionnaire investigation to the residents and visitors is conducted during these periods in order to clarify residents and visitors' needs for the shopping street, and utilize them to the plan building of the area rebirth and/or regional revitalization of shopping street. In this paper, we mainly focus the impression the visitors feel and analyze them. These are analyzed by using Bayesian Network. By that model, the causal relationship is sequentially chained by the characteristics of visitors, the purpose of visiting and the image of the surrounding area at this shopping street.

The Results for Bayesian Network Analysis are as follows.

In the Bayesian Network Analysis, model was built under the examination of the causal relationship among items. Sensitively Analysis was conducted after that. The main result of sensitively analysis is as follows.

We can observe that "Those who have an image of the surrounding area at this shopping street as "Fascinating" had come under the image of the surrounding area at this shopping street as "Beautiful", "Of the united feeling there is", "Varied"," Cheerful", "Individualistic", "Friendly", "Healed", "Open" "Want to play", "Lively" or "Atmosphere of urban" of an age of "**10th**" or "**20th**".

We can observe that "Those who have an image of the surrounding area at this shopping street as "Want to play" had come under the image of the surrounding area at this shopping street as "Of the united feeling there is", "Cheerful", "Individualistic", "Friendly", "Healed", "Open", "Fascinating", "Lively" or "Atmosphere of urban" of an age of "10th", "**20th**" or "40th".

  We can observe that "Those who have an image of the surrounding area at this shopping street as "Calm" had come with the purpose of visiting for "Shopping" or "Leisure, amusement" under the image of the surrounding area at this shopping street as "Scattered", "Unfriendly"," Stimulated" or "Want to examine deliberately" of an age of "40th", "50th", "**60th**" or "**More than 70**" in which the gender is "Female".

The analysis utilizing Bayesian Network enabled us to visualize the causal relationship among items. Furthermore, sensitivity analysis brought us estimating and predicting the prospective visitors. These are utilized for constructing a much more effective and useful plan building.

Although it has a limitation that it is restricted in the number of research, we could obtain the fruitful results. To confirm the findings by utilizing the new consecutive visiting records would be the future works to be investigated.

References

Atami city. (2015). 2014 Survey of Tourist Behavior.

Doi, H. (2009). Evaluation of policies to build tourist destinations and statistical analysis. Nippon Hyoron Sha.

Ingu, S., Uemura, M., Uchida, Y., Omiya, M., Miura, T., & Hironori, H. (2017). A study on the application of geothermal power generation to local revitalization in Obama Town, Unzen City: in consideration of futurability in Obama. *Environmental Science Research, Nagasaki University, 20*(1), 51-63.

Inoue, A. (2017). Changes in Local Communities Brought by Municipal Mergers: From the Viewpoint of Tourism Promotion as the Main Industry. *Bulletin of the Faculty of Regional Development Studies, Otemon Gakuin University, 2*, 1-32.

Japan Tourism Agency. (2015). Research study on economic impacts of tourism in Japan 2013, p3.

Kano, M. (2011). Characteristic analysis of Atami tourists: Reconsideration based on data add and modify. *Shizuoka Economic Research, 16*(2), 61-78. Shizuoka University

Kotani, A. (2017). The implementation report of the Machi-lab shutter art project. *Bulletin of Wakkanai Hokusei Gakuen University*, (17), 207-218.

Ohkubo, Y. (2017). Current status and problems in Jigenji-dori shopping area: from a consumer questionnaire. *Bulletin of Local Research, Kagoshima International University, 44*(2), 1-15.

Retrieved from http://www.kawazu-onsen.com/eng/

Retrieved from https://www.jnto.go.jp/eng/location/rtg/pdf/pg-410.pdf#search='Izupeninsula'

Shioya, H. (2009). Overview and application of tourism statistics: Analysis using statistical survey on overnight travels. *Journal of Economic Structures, 17*(1-2), 16-29. Pan Pacific Association of Input-Output Studies.

Yoshida, I. (2009). Consideration on the Characteristic of Visitors' Activity and the Research Method for Tourist Visitors in Urban Areas.

Appendix 1. Questionnaire sheet about the image around the shopping street

1. How often do you come to this shopping street?

a. Everyday   b. (   ) times a week   c. (   ) times a month   d. (   ) times a year

e. miscellaneous (   )

2. What is the purpose of visiting here? (Plural answers allowed)

a. shopping   b. eating and drinking   c. business   d. celebration、event   e. leisure, amusement

f. miscellaneous (   )

3. How do you feel about the image of the surrounding area at this shopping street?

Select the position

Beautiful	•	•	•	•	•	Ugly
Of the united feeling there is	•	•	•	•	•	Scattered
Varied	•	•	•	•	•	Featureless
New	•	•	•	•	•	Historic
Full of nature	•	•	•	•	•	Urban
Cheerful	•	•	•	•	•	Gloomy
Individualistic	•	•	•	•	•	Conventional
Friendly	•	•	•	•	•	Unfriendly
Healed	•	•	•	•	•	Stimulated
Open	•	•	•	•	•	exclusive
Want to reside	•	•	•	•	•	Do not want to reside
Warm	•	•	•	•	•	Aloof
Fascinating	•	•	•	•	•	Not fascinating
Want to play	•	•	•	•	•	Want to examine deliberately
Lively	•	•	•	•	•	Calm
Atmosphere of urban	•	•	•	•	•	Atmosphere of rural area

4. There are many old building at the age of nearly 50 years. Do you think we can still use them?

a. Can use it   b. Cannot use it   C. Have no idea

5. Is there any functions or facilities that will be useful?

6. Comments

7. Sex

a. Male b. Female

8. Age

a.10th   b.20th   c.30th   d.40th   e.50th   f.6th   g. More than70

9. Residence

a. Fuji City   b. Fujinomiya City   c. Numazu City   d. Mishima City   e. Shizuoka City   f. Miscellaneous in Shizuoka Prefecture

g. Outside of Shizuoka Prefecture ［   ］

Appendix 2. Calculated posterior probability

Column header groups: **The purpose of visiting** (Shopping, Eating and drinking, Business, Celebration/event, Leisure/amusement) and **The image of the surrounding area at this shopping street** (Beautiful, Ugly, Of the united feeling there is, Scattered, Varied, Featureless, New, Historic, Full of nature, Urban, Cheerful, Gloomy, Individualistic, Conventional, Friendly, Unfriendly).

name	state	Prior	Shopping	Eating and drinking	Business	Celebration, event	Leisure, amusement	Beautiful	Ugly	Of the united feeling there is	Scattered	Varied	Featureless	New	Historic	Full of nature	Urban	Cheerful	Gloomy	Individualistic	Conventional	Friendly	Unfriendly
The purpose of visiting	Shopping	0.224	1	0.213	0.219	0.221	0.238	0.222	0.226	0.220	0.229	0.219	0.236	0.231	0.223	0.225	0.226	0.230	0.226	0.218	0.225	0.219	0.232
	Eating and drinking	0.163	0.156	1	0.168	0.170	0.146	0.156	0.165	0.156	0.158	0.160	0.164	0.163	0.157	0.160	0.156	0.167	0.170	0.154	0.170	0.155	0.167
	Business	0.087	0.085	0.090	1	0.088	0.084	0.086	0.087	0.087	0.087	0.087	0.087	0.086	0.087	0.088	0.087	0.088	0.087	0.087	0.087	0.087	0.087
	Celebration, event	0.466	0.460	0.485	0.469	1	0.453	0.459	0.470	0.453	0.461	0.474	0.465	0.467	0.460	0.464	0.455	0.471	0.453	0.474	0.456	0.473	0.473
	Leisure, amusement	0.058	0.062	0.053	0.056	0.057	1	0.060	0.058	0.058	0.058	0.059	0.058	0.059	0.058	0.060	0.058	0.058	0.058	0.058	0.059	0.059	0.059
The image of the surrounding area at this shopping street	Beautiful	0.327	0.324	0.311	0.324	0.322	0.333	1	0	0.332	0.315	0.335	0.323	0.325	0.327	0.334	0.325	0.335	0.322	0.333	0.323	0.334	0.321
	Ugly	0.275	0.279	0.279	0.275	0.278	0.276	0	1	0.270	0.281	0.274	0.276	0.274	0.272	0.274	0.275	0.270	0.277	0.272	0.277	0.271	0.279
	Of the united feeling there is	0.269	0.264	0.256	0.270	0.262	0.265	0.274	0.264	1	0	0.281	0.265	0.266	0.269	0.272	0.267	0.283	0.262	0.285	0.260	0.280	0.258
	Scattered	0.352	0.353	0.337	0.349	0.348	0.358	0.360	0.350	0	1	0.345	0.360	0.348	0.352	0.376	0.383	0.358	0.348	0.359	0.349	0.358	0.349
	Varied	0.377	0.387	0.393	0.378	0.384	0.379	0.364	0.385	0.366	0.315	1	0	0.381	0.376	0.369	0.362	0.386	0.363	0.391	0.363	0.364	0.390
	Featureless	0.177	0.172	0.171	0.177	0.175	0.175	0.181	0.176	0.181	0.181	0.171	1	0.174	0.177	0.180	0.175	0.182	0.173	0.183	0.174	0.182	0.173
	New	0.130	0.133	0.130	0.128	0.129	0.131	0.129	0.130	0.128	0.131	0.128	0.129	1	0	0.130	0.129	0.129	0.131	0.127	0.132	0.127	0.133
	Historic	0.587	0.584	0.589	0.587	0.588	0.587	0.588	0.585	0.586	0.585	0.586	0.588	0	1	0.586	0.587	0.586	0.587	0.587	0.587	0.587	0.586
	Full of nature	0.352	0.353	0.337	0.349	0.348	0.356	0.360	0.350	0.356	0.345	0.360	0.348	0.352	0.352	1	0	0.358	0.348	0.359	0.349	0.358	0.349
	Urban	0.236	0.238	0.233	0.237	0.235	0.241	0.234	0.236	0.233	0.239	0.233	0.239	0.234	0.236	0	1	0.233	0.238	0.235	0.236	0.236	0.237
	Cheerful	0.295	0.290	0.283	0.296	0.289	0.292	0.303	0.290	0.310	0.283	0.304	0.290	0.293	0.295	0.301	0.292	1	0	0.233	0.256	0.249	0.256
	Gloomy	0.406	0.412	0.416	0.408	0.410	0.405	0.399	0.408	0.395	0.415	0.398	0.411	0.410	0.406	0.401	0.410	0	1	0.393	0.310	0.287	0.285
	Individualistic	0.252	0.245	0.237	0.253	0.245	0.250	0.257	0.249	0.266	0.242	0.261	0.246	0.247	0.251	0.256	0.252	0.264	0.244	1	0	0.264	0.240
	Conventional	0.406	0.410	0.424	0.407	0.413	0.404	0.401	0.409	0.392	0.415	0.399	0.409	0.412	0.406	0.402	0.410	0.395	0.414	0	1	0.413	0.417
	Friendly	0.468	0.458	0.444	0.468	0.458	0.469	0.479	0.461	0.487	0.451	0.480	0.462	0.457	0.468	0.475	0.468	0.485	0.457	0.490	0.454	1	0
	Unfriendly	0.220	0.229	0.228	0.220	0.224	0.224	0.216	0.224	0.212	0.228	0.215	0.224	0.225	0.220	0.218	0.222	0.213	0.226	0.210	0.227	0	1
	Stimulated	0.197	0.206	0.200	0.197	0.199	0.202	0.193	0.201	0.190	0.205	0.193	0.200	0.200	0.196	0.196	0.202	0.190	0.202	0.191	0.201	0.191	0.205
	Healed	0.294	0.285	0.286	0.294	0.289	0.291	0.301	0.288	0.306	0.282	0.302	0.288	0.291	0.294	0.298	0.289	0.306	0.287	0.306	0.287	0.304	0.283
	Open	0.264	0.258	0.256	0.266	0.260	0.262	0.269	0.259	0.275	0.256	0.268	0.263	0.261	0.265	0.267	0.265	0.274	0.260	0.274	0.259	0.273	0.256
	Exclusive	0.376	0.387	0.385	0.374	0.380	0.380	0.372	0.380	0.378	0.383	0.370	0.378	0.385	0.375	0.374	0.373	0.368	0.381	0.364	0.383	0.366	0.386
	Want to reside	0.251	0.254	0.245	0.251	0.249	0.253	0.254	0.251	0.256	0.248	0.255	0.250	0.251	0.251	0.254	0.251	0.256	0.250	0.255	0.249	0.254	0.251
	Do not want to reside	0.393	0.394	0.393	0.394	0.392	0.395	0.389	0.392	0.393	0.397	0.387	0.398	0.391	0.394	0.390	0.400	0.390	0.396	0.391	0.393	0.392	0.394
	Warm	0.444	0.446	0.426	0.440	0.437	0.453	0.450	0.440	0.455	0.436	0.448	0.442	0.443	0.444	0.449	0.444	0.453	0.438	0.455	0.436	0.453	0.436
	Aloof	0.216	0.217	0.225	0.218	0.219	0.212	0.211	0.219	0.212	0.222	0.213	0.217	0.218	0.216	0.213	0.217	0.212	0.219	0.213	0.219	0.212	0.220
	Fascinating	0.264	0.258	0.249	0.263	0.257	0.265	0.274	0.259	0.279	0.250	0.275	0.258	0.260	0.264	0.272	0.260	0.279	0.256	0.279	0.255	0.277	0.253
	Not fascinating	0.383	0.389	0.390	0.383	0.388	0.387	0.378	0.386	0.372	0.392	0.376	0.389	0.386	0.384	0.379	0.387	0.373	0.389	0.371	0.390	0.375	0.392
	Want to play	0.232	0.222	0.217	0.231	0.224	0.230	0.241	0.224	0.251	0.215	0.241	0.225	0.227	0.233	0.237	0.226	0.249	0.221	0.250	0.221	0.247	0.216
	Want to examine deliberately	0.320	0.337	0.311	0.315	0.317	0.339	0.318	0.320	0.314	0.326	0.312	0.325	0.327	0.319	0.320	0.326	0.314	0.325	0.311	0.323	0.315	0.329
	Lively	0.207	0.196	0.197	0.210	0.202	0.198	0.213	0.202	0.219	0.196	0.216	0.201	0.202	0.207	0.211	0.206	0.219	0.201	0.221	0.200	0.218	0.196
	Calm	0.513	0.528	0.514	0.509	0.515	0.528	0.509	0.518	0.502	0.523	0.505	0.518	0.519	0.513	0.511	0.516	0.503	0.519	0.501	0.519	0.504	0.524
	Atmosphere of urban	0.102	0.099	0.097	0.104	0.101	0.098	0.103	0.102	0.107	0.099	0.105	0.101	0.098	0.102	0.103	0.101	0.106	0.100	0.107	0.099	0.106	0.099
	Atmosphere of rural area	0.625	0.636	0.629	0.621	0.627	0.637	0.620	0.629	0.614	0.635	0.617	0.629	0.630	0.624	0.622	0.629	0.614	0.630	0.614	0.630	0.616	0.634
Gender	Female	0.511	0.594	0.398	0.442	0.483	0.657	0.543	0.512	0.503	0.501	0.504	0.501	0.556	0.506	0.539	0.497	0.506	0.493	0.503	0.501	0.509	0.516
	Male	0.489	0.406	0.602	0.558	0.517	0.343	0.457	0.488	0.497	0.499	0.496	0.499	0.444	0.494	0.461	0.503	0.494	0.507	0.497	0.499	0.491	0.484
Age	10th	0.162	0.136	0.067	0.162	0.121	0.180	0.194	0.141	0.256	0.111	0.206	0.143	0.123	0.160	0.187	0.173	0.224	0.121	0.149	0.157	0.172	0.153	0.097
	20th	0.148	0.151	0.164	0.148	0.138	0.119	0.168	0.141	0.211	0.119	0.160	0.122	0.182	0.143	0.164	0.121	0.179	0.149	0.147	0.159	0.144	0.155
	30th	0.223	0.167	0.255	0.223	0.253	0.215	0.248	0.211	0.187	0.204	0.229	0.188	0.190	0.238	0.224	0.209	0.202	0.220	0.187	0.244	0.220	0.213
	40th	0.174	0.189	0.215	0.174	0.183	0.147	0.131	0.183	0.189	0.200	0.132	0.229	0.123	0.175	0.141	0.149	0.163	0.176	0.157	0.172	0.153	0.180
	50th	0.116	0.117	0.155	0.116	0.130	0.105	0.096	0.147	0.085	0.147	0.127	0.102	0.118	0.105	0.113	0.116	0.091	0.120	0.119	0.125	0.096	0.128
	60th	0.105	0.129	0.100	0.105	0.100	0.136	0.088	0.102	0.082	0.139	0.069	0.133	0.118	0.105	0.090	0.154	0.078	0.132	0.080	0.119	0.090	0.128
	More than70	0.072	0.110	0.043	0.072	0.075	0.098	0.076	0.084	0.058	0.081	0.076	0.083	0.067	0.073	0.082	0.078	0.063	0.083	0.054	0.077	0.065	0.099

The image of the surrounding area at this shopping street

	Healed	Stimulated	Open	Exclusive	Want to reside	Do not want to reside	Warm	Aloof	Fascinating	Not Fascinating	Want to play	Want to examine carefully	Lively	Calm	Atmosphere of urban	Atmosphere of rural area	Gender Male	Female	Age 10th	20th	30th	40th	50th	60th	More than70
	0.217	0.232	0.219	0.229	0.226	0.224	0.224	0.223	0.219	0.226	0.214	0.235	0.214	0.230	0.218	0.227	0.186	0.260	0.188	0.229	0.168	0.343	0.224	0.275	0.343
	0.158	0.165	0.158	0.167	0.158	0.163	0.156	0.170	0.153	0.166	0.153	0.158	0.156	0.162	0.158	0.163	0.200	0.127	0.181	0.229	0.186	0.202	0.218	0.155	0.097
	0.087	0.088	0.087	0.087	0.087	0.088	0.086	0.088	0.087	0.087	0.087	0.086	0.088	0.087	0.089	0.087	0.100	0.075	0.087	0.087	0.087	0.087	0.087	0.087	0.097
	0.058	0.060	0.058	0.059	0.059	0.059	0.060	0.057	0.059	0.059	0.058	0.061	0.057	0.060	0.057	0.059	0.041	0.075	0.065	0.047	0.056	0.049	0.053	0.076	0.079
	0.470	0.457	0.461	0.471	0.465	0.458	0.472	0.453	0.471	0.450	0.461	0.468	0.455	0.462	0.467	0.440	0.492	0.440	0.347	0.435	0.527	0.491	0.522	0.444	0.486
	0.058	0.060	0.058	0.059	0.059	0.059	0.058	0.059	0.059	0.057	0.058	0.057	0.057	0.060	0.057	0.057	0.075	0.056	0.065	0.047	0.056	0.049	0.053	0.076	0.079
	0.335	0.319	0.332	0.323	0.330	0.334	0.331	0.319	0.339	0.322	0.340	0.325	0.337	0.324	0.330	0.324	0.305	0.347	0.391	0.371	0.363	0.245	0.268	0.274	0.345
	0.270	0.281	0.269	0.278	0.274	0.274	0.272	0.279	0.269	0.277	0.265	0.276	0.269	0.278	0.274	0.277	0.275	0.265	0.240	0.245	0.260	0.289	0.348	0.267	0.322
	0.281	0.259	0.280	0.263	0.274	0.269	0.276	0.264	0.284	0.262	0.292	0.264	0.286	0.264	0.281	0.265	0.274	0.275	0.393	0.298	0.225	0.293	0.197	0.209	0.217
	0.361	0.393	0.365	0.385	0.372	0.381	0.370	0.388	0.356	0.386	0.350	0.385	0.357	0.385	0.366	0.383	0.385	0.370	0.258	0.304	0.345	0.433	0.476	0.497	0.426
	0.181	0.174	0.179	0.174	0.179	0.174	0.178	0.174	0.184	0.173	0.184	0.172	0.185	0.174	0.182	0.175	0.179	0.174	0.225	0.192	0.181	0.135	0.193	0.116	0.188
	0.464	0.481	0.470	0.475	0.471	0.479	0.470	0.475	0.461	0.480	0.459	0.481	0.461	0.478	0.470	0.476	0.482	0.464	0.418	0.390	0.485	0.510	0.414	0.599	0.549
	0.128	0.132	0.128	0.133	0.130	0.129	0.129	0.131	0.128	0.130	0.127	0.133	0.127	0.131	0.124	0.131	0.118	0.141	0.098	0.173	0.110	0.136	0.138	0.146	0.121
	0.587	0.584	0.588	0.586	0.586	0.587	0.586	0.585	0.587	0.587	0.588	0.586	0.586	0.586	0.588	0.586	0.593	0.580	0.581	0.569	0.625	0.589	0.532	0.587	0.597
	0.357	0.349	0.355	0.350	0.356	0.349	0.356	0.347	0.362	0.349	0.360	0.352	0.361	0.351	0.356	0.351	0.332	0.371	0.390	0.352	0.352	0.286	0.341	0.303	0.400
	0.232	0.242	0.236	0.234	0.235	0.240	0.237	0.237	0.232	0.238	0.229	0.241	0.233	0.237	0.233	0.237	0.242	0.229	0.192	0.221	0.221	0.202	0.234	0.345	0.257
	0.307	0.285	0.306	0.289	0.301	0.293	0.301	0.289	0.312	0.287	0.317	0.290	0.313	0.289	0.306	0.290	0.299	0.292	0.408	0.358	0.268	0.277	0.231	0.220	0.258
	0.396	0.416	0.399	0.411	0.403	0.409	0.400	0.411	0.392	0.412	0.386	0.413	0.395	0.410	0.397	0.409	0.420	0.391	0.304	0.410	0.399	0.410	0.417	0.508	0.190
	0.263	0.244	0.261	0.244	0.256	0.251	0.258	0.248	0.266	0.244	0.271	0.245	0.270	0.246	0.264	0.248	0.256	0.248	0.399	0.251	0.211	0.227	0.258	0.192	0.467
	0.397	0.413	0.397	0.414	0.402	0.406	0.399	0.412	0.392	0.413	0.386	0.411	0.393	0.411	0.393	0.410	0.414	0.398	0.263	0.437	0.443	0.401	0.435	0.461	0.434
	0.484	0.455	0.483	0.455	0.474	0.467	0.477	0.458	0.490	0.458	0.498	0.460	0.492	0.460	0.485	0.461	0.470	0.465	0.671	0.457	0.460	0.413	0.386	0.399	0.425
	0.212	0.229	0.214	0.226	0.220	0.221	0.216	0.224	0.211	0.225	0.205	0.227	0.210	0.225	0.213	0.224	0.218	0.222	0.133	0.231	0.210	0.228	0.242	0.269	0.305
	1	0	0.304	0.214	0.297	0.292	0.299	0.288	0.309	0.287	0.315	0.286	0.310	0.288	0.302	0.289	0.294	0.294	0.389	0.344	0.303	0.276	0.237	0.209	0.208
	0	1	0.191	0.200	0.197	0.217	0.194	0.202	0.188	0.201	0.182	0.204	0.189	0.201	0.192	0.200	0.200	0.194	0.152	0.179	0.160	0.182	0.253	0.277	0.283
	0.273	0.256	0.304	0.288	0.297	0.292	0.299	0.288	0.188	0.287	0.315	0.217	0.212	0.218	0.212	0.218	0.229	0.204	0.175	0.211	0.200	0.231	0.279	0.247	0.191
	0.369	0.382	0	1	0.374	0.375	0.372	0.380	0.366	0.381	0.362	0.382	0.363	0.382	0.365	0.380	0.357	0.394	0.259	0.417	0.369	0.412	0.410	0.388	0.419
	0.254	0.251	0.254	0.250	1	0	0.253	0.249	0.257	0.249	0.256	0.252	0.256	0.251	0.256	0.250	0.252	0.251	0.287	0.278	0.218	0.343	0.224	0.220	0.229
	0.382	0.382	0	1	0	1	0.372	0.380	0.366	0.381	0.362	0.382	0.363	0.382	0.365	0.380	0.357	0.394	0.259	0.417	0.369	0.412	0.410	0.388	0.419
	0.300	0.397	0.395	0.391	0	1	0.393	0.394	0.388	0.396	0.389	0.308	0.390	0.394	0.390	0.394	0.404	0.382	0.399	0.350	0.378	0.409	0.345	0.513	0.377
	0.254	0.251	0.254	0.250	1	0	0.253	0.249	0.257	0.249	0.256	0.252	0.256	0.251	0.256	0.250	0.252	0.251	0.287	0.278	0.218	0.343	0.224	0.220	0.229
	0.452	0.437	0.452	0.440	0.474	0.444	0.477	0	0.456	0.439	0.462	0.445	0.452	0.442	0.449	0.443	0.413	0.474	0.547	0.444	0.419	0.451	0.383	0.421	0.410
	0.212	0.221	0.212	0.219	0.214	0.217	0	1	0.209	0.219	0.207	0.217	0.212	0.218	0.212	0.218	0.229	0.204	0.175	0.211	0.200	0.231	0.279	0.247	0.191
	0.277	0.253	0.274	0.257	0.270	0.261	0.271	0.256	0	1	0.288	0.258	0.282	0.258	0.276	0.259	0.256	0.272	0.295	0.317	0.256	0.228	0.197	0.156	0.256
	0.374	0.391	0.377	0.388	0.379	0.386	0.379	0.387	0	1	0.367	0.389	0.370	0.388	0.375	0.387	0.381	0.386	0.388	0.345	0.408	0.391	0.399	0.469	0.414
	0.249	0.214	0.246	0.223	0.236	0.230	0.241	0.223	0.253	0.222	0	1	0.252	0.245	0.226	0.225	0.239	0.272	0.380	0.234	0.246	0.118	0.124	0.121
	0.312	0.330	0.317	0.324	0.321	0.324	0.320	0.320	0.313	0.324	0	1	0.309	0.327	0.308	0.324	0.287	0.351	0.276	0.331	0.272	0.312	0.279	0.464	0.417
	0.218	0.198	0.217	0.199	0.211	0.205	0.211	0.202	0.221	0.199	0.225	0.199	1	0	0.218	0.201	0.229	0.186	0.319	0.252	0.195	0.156	0.172	0.143	0.168
	0.502	0.524	0.504	0.520	0.512	0.514	0.511	0.516	0.502	0.519	0.495	0.524	0	1	0.502	0.518	0.482	0.543	0.425	0.484	0.499	0.531	0.538	0.591	0.617
	0.105	0.099	0.105	0.099	0.104	0.102	0.103	0.100	0.107	0.100	0.108	0.099	0.108	0.100	1	0	0.115	0.090	0.146	0.079	0.102	0.108	0.086	0.054	0.135
	0.615	0.635	0.616	0.631	0.621	0.627	0.622	0.629	0.612	0.631	0.607	0.634	0.609	0.631	0	1	0.596	0.652	0.545	0.589	0.615	0.630	0.683	0.728	0.648
	0.489	0.496	0.507	0.464	0.490	0.503	0.454	0.518	0.474	0.485	0.473	0.439	0.540	0.459	0.485	0	1	0	0.489	0.589	0.615	0.630	0.683	0.489	0.489
	0.511	0.504	0.493	0.536	0.510	0.497	0.546	0.482	0.526	0.515	0.527	0.561	0.460	0.541	0.550	0.467	0	1	0.511	0.511	0.511	0.511	0.511	0.511	0.511
	0.214	0.124	0.214	0.112	0.185	0.164	0.199	0.131	0.238	0.124	0.265	0.140	0.250	0.134	0.231	0.141	0.162	0.162	1	0	0	0	0	0	0
	0.173	0.134	0.162	0.164	0.163	0.132	0.148	0.144	0.177	0.133	0.173	0.153	0.180	0.139	0.115	0.139	0.148	0.148	0	1	0	0	0	0	0
	0.230	0.181	0.219	0.219	0.194	0.215	0.211	0.206	0.217	0.238	0.225	0.190	0.211	0.217	0.222	0.230	0.223	0.223	0	0	1	0	0	0	0
	0.163	0.160	0.168	0.190	0.168	0.181	0.177	0.185	0.150	0.177	0.184	0.170	0.131	0.180	0.183	0.175	0.174	0.174	0	0	0	1	0	0	0
	0.094	0.149	0.076	0.127	0.104	0.102	0.100	0.150	0.087	0.121	0.062	0.101	0.097	0.122	0.098	0.127	0.116	0.116	0	0	0	0	1	0	0
	0.075	0.148	0.102	0.108	0.092	0.137	0.100	0.120	0.062	0.129	0.053	0.153	0.073	0.121	0.056	0.123	0.105	0.105	0	0	0	0	0	1	0
	0.051	0.103	0.059	0.080	0.094	0.069	0.066	0.064	0.069	0.078	0.037	0.094	0.058	0.086	0.095	0.074	0.072	0.072	0	0	0	0	0	0	1

Appendix 3. Difference of probability

name	state	Prior	The purpose of visiting: Shopping	Eating and drinking	Business	Celebration, event	Leisure, amusement	The image of the surrounding area at this shopping street: Beautiful	Ugly	Of the united feeling there is	Scattered	Varied	Featureless	New	Historic	Full of nature	Urban	Cheerful	Gloomy	Individualistic	Conventional	Friendly	Unfriendly
The purpose of visiting / Shopping		0.224	1	-0.011	-0.005	-0.002	0.015	-0.001	0.003	-0.004	0.005	-0.004	0.002	0.007	-0.001	0.001	0.002	-0.004	0.003	-0.005	0.001	-0.004	0.008
Eating and drinking		0.163	-0.007	1	0.005	0.008	-0.017	-0.007	0.003	0.007	0.007	-0.004	0.001	0.002	0.000	-0.001	-0.003	-0.006	0.005	-0.008	0.007	0.000	0.008
Business		0.087	-0.002	0.003	1	0.001	-0.004	-0.001	0.000	0.000	0.000	0.000	0.000	-0.001	0.000	-0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.005
Celebration, event		0.466	0.019	-0.004	0.001	1	-0.013	-0.006	0.004	-0.012	0.008	-0.005	0.003	-0.001	0.001	-0.006	-0.002	-0.011	0.005	-0.013	0.008	-0.010	0.007
Leisure, amusement		0.058	0.004	-0.002	-0.003	-0.001	1	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.001
The image of the surrounding area at this shopping street / Beautiful		0.327	-0.002	-0.016	-0.003	-0.004	0.006	1	0	-0.005	0.006	0.004	-0.006	-0.002	0.001	0.007	-0.004	0.008	-0.005	0.007	-0.004	0.008	-0.006
Ugly		0.275	0.004	0.004	0.000	0.002	0.001	0	1	0.005	-0.001	0.008	0.005	-0.001	0.001	0.001	0.001	-0.001	0.008	0.014	0.002	0.011	0.002
Of the united feeling there is		0.269	0.004	-0.014	0.001	-0.007	-0.004	0.004	-0.005	1	0	0.006	-0.004	-0.003	0.000	0.003	0.004	0.013	-0.007	-0.003	0.002	0.011	-0.011
Scattered		0.377	0.010	0.016	0.001	0.007	0.002	-0.013	0.008	0	1	-0.012	0.007	0.004	0.000	-0.008	0.000	-0.016	0.009	0.015	-0.009	-0.013	0.013
Varied		0.177	-0.004	-0.006	0.000	-0.002	-0.002	0.004	-0.005	0.004	-0.005	1	0	-0.002	0.002	0.004	0.000	0.005	-0.003	0.007	0.003	0.005	-0.004
Featureless		0.473	0.006	0.004	0.001	0.003	0.006	-0.006	0.001	-0.007	0.009	0	1	-0.001	0.002	-0.004	0.007	-0.009	0.006	0.011	0.006	-0.006	0.005
New		0.130	0.004	0.000	-0.002	0.000	0.001	0.000	0.000	-0.004	0.001	0.001	-0.001	1	0	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Historic		0.587	-0.002	0.002	0.001	0.001	0.000	0.008	-0.002	0.008	-0.008	0.007	-0.006	0	1	0.005	-0.005	0.012	-0.007	0.012	-0.007	0.010	-0.011
Full of nature		0.352	0.001	-0.015	-0.003	-0.004	0.005	0.004	0.000	0.004	0.004	0.000	0.004	-0.001	0.000	1	0	0.006	-0.004	0.006	-0.004	0.006	-0.003
Urban		0.236	0.002	-0.006	0.001	-0.001	0.006	-0.001	0.000	0.007	-0.008	0.007	-0.004	0.000	-0.001	0	1	0.008	-0.006	0.010	-0.007	0.007	-0.008
Cheerful		0.295	-0.006	-0.013	0.000	-0.007	-0.004	0.007	-0.005	0.014	-0.012	0.008	-0.006	-0.002	0.000	0.005	-0.003	1	0	0.014	-0.008	0.011	-0.010
Gloomy		0.406	0.007	0.011	0.002	0.005	0.000	-0.006	0.008	-0.010	0.010	-0.008	0.005	0.009	0.000	-0.004	0.004	0	1	-0.013	0.008	0.000	0.011
Individualistic		0.252	-0.007	-0.015	0.001	-0.007	-0.002	0.005	-0.003	0.014	-0.010	0.009	-0.006	-0.005	-0.001	0.004	0.000	0.012	-0.008	1	0	0.012	-0.012
Conventional		0.406	0.004	0.018	0.001	0.007	-0.002	-0.005	0.003	-0.014	0.009	-0.007	0.004	0.006	0.000	-0.004	0.007	-0.011	0.012	-0.013	1	-0.012	0.011
Friendly		0.468	-0.010	-0.023	0.000	-0.010	0.001	0.011	-0.007	0.019	-0.016	0.013	-0.005	-0.010	0.000	0.008	0.001	0.017	-0.011	0.023	-0.012	1	0
Unfriendly		0.220	0.009	0.008	0.000	0.004	0.004	-0.004	0.003	-0.009	0.008	-0.005	0.003	0.005	0.000	-0.002	0.001	-0.008	0.006	-0.011	0.006	0	1
Open		0.264	0.009	-0.008	0.001	-0.003	0.004	0.005	-0.006	0.011	-0.009	0.008	-0.001	-0.003	0.001	0.005	0.005	0.009	-0.007	0.011	-0.006	0.009	-0.008
Stimulated		0.197	0.009	-0.008	0.000	0.002	0.004	-0.004	0.004	-0.007	0.008	-0.004	0.003	0.003	-0.001	-0.002	0.005	-0.007	0.008	-0.006	0.004	-0.006	0.008
Healed		0.294	-0.009	-0.008	0.000	-0.005	-0.003	0.007	-0.006	0.012	-0.012	0.008	-0.006	-0.003	0.000	0.004	-0.005	0.012	-0.007	0.012	-0.007	0.010	-0.011
Exclusive		0.376	0.010	0.009	-0.003	0.004	-0.003	-0.004	0.004	-0.009	0.007	-0.006	0.001	0.009	-0.001	0.005	0.000	-0.008	0.005	-0.012	0.007	-0.010	0.010
Want to reside		0.251	0.003	-0.006	0.000	-0.003	0.002	0.003	-0.001	0.005	-0.003	0.003	-0.001	0.000	0.000	0.003	0.007	0.005	-0.001	0.004	0.007	0.003	-0.001
Do not want to reside		0.393	0.001	0.000	0.002	-0.001	0.002	-0.004	0.000	0.000	0.004	-0.006	0.005	-0.002	0.001	-0.003	0.007	-0.003	0.003	-0.002	0.000	0.000	0.001
Warm		0.444	0.001	-0.019	-0.004	-0.007	0.009	0.006	-0.004	0.011	-0.008	0.004	-0.003	-0.001	0.000	0.004	-0.001	0.009	-0.006	0.011	-0.008	0.009	-0.008
Aloof		0.216	0.009	0.009	0.002	0.003	-0.005	-0.006	0.003	-0.004	0.006	-0.003	0.001	0.002	0.000	-0.003	0.001	-0.005	0.003	-0.003	0.003	-0.005	0.004
Fascinating		0.264	0.005	-0.016	-0.001	-0.007	0.001	0.010	-0.005	0.014	-0.015	0.011	-0.007	-0.004	0.000	0.007	0.004	0.015	-0.008	0.015	-0.009	0.012	-0.011
Not fascinating		0.383	0.005	0.007	0.000	0.004	0.004	-0.005	0.003	-0.011	0.009	-0.007	0.005	0.002	0.001	-0.004	0.004	-0.010	0.006	-0.012	0.006	-0.008	0.008
Want to play		0.232	-0.010	-0.015	-0.001	-0.008	-0.003	0.009	-0.008	0.019	-0.017	0.009	-0.007	-0.005	0.001	0.005	-0.006	0.017	-0.011	0.018	-0.011	0.015	-0.016
Want to examine deliberately		0.320	0.017	-0.008	0.003	-0.003	0.019	-0.001	0.001	-0.005	0.006	-0.007	0.005	0.008	0.000	0.000	0.007	-0.005	0.005	-0.008	0.003	-0.005	0.009
Lively		0.207	-0.010	-0.009	-0.004	-0.005	0.015	0.007	-0.005	0.012	-0.011	0.010	-0.005	-0.005	0.000	0.005	-0.001	0.012	-0.006	0.014	-0.007	0.011	-0.010
Calm		0.513	0.015	0.001	0.002	0.002	-0.008	-0.004	0.004	-0.011	0.010	-0.008	0.005	0.006	0.000	-0.002	0.003	-0.010	0.006	-0.012	0.006	-0.005	0.011
Atmosphere of urban area		0.102	-0.003	-0.005	0.002	-0.001	-0.004	0.001	0.000	0.004	-0.003	0.003	-0.001	-0.004	0.000	0.001	0.003	0.004	-0.002	0.005	-0.003	0.004	-0.003
Atmosphere of rural area		0.625	0.011	0.004	-0.004	0.002	0.013	-0.005	0.004	-0.011	0.010	-0.008	0.010	0.006	-0.001	-0.003	-0.001	-0.011	0.005	-0.010	0.010	-0.009	0.009
Gender / Male		0.489	0.082	0.113	0.069	0.028	-0.146	-0.032	0.004	0.008	0.010	0.007	0.010	0.045	0.005	0.028	0.014	0.005	0.018	0.008	0.010	0.003	0.004
Female		0.511	-0.082	-0.113	-0.069	-0.041	0.146	0.032	-0.001	-0.008	-0.010	-0.007	-0.010	-0.045	-0.005	-0.028	-0.014	-0.005	-0.018	-0.008	-0.010	-0.003	-0.004
Age / 10th		0.162	-0.026	-0.094	0.000	0.000	0.018	0.032	0.001	0.074	-0.010	0.044	-0.010	0.045	-0.005	0.028	0.011	0.062	-0.040	0.094	-0.057	0.070	-0.065
20th		0.148	0.004	0.017	0.000	-0.010	-0.029	0.020	-0.016	0.016	-0.029	0.012	-0.026	-0.039	-0.002	0.016	-0.027	0.031	0.002	-0.001	0.011	-0.003	0.007
30th		0.223	-0.056	0.031	0.000	0.029	-0.008	0.025	-0.012	-0.036	-0.019	0.006	0.006	-0.033	-0.004	0.000	-0.014	-0.021	-0.004	-0.037	0.020	-0.004	0.006
40th		0.174	0.015	0.041	0.000	0.009	-0.027	-0.043	0.009	0.015	0.026	-0.042	0.014	0.008	0.001	0.033	-0.025	-0.011	0.002	-0.017	-0.002	-0.021	0.006
50th		0.116	0.000	0.039	0.000	0.014	-0.012	-0.021	0.031	0.031	0.031	0.010	-0.014	0.007	-0.011	-0.004	-0.001	0.025	0.003	0.003	0.008	-0.020	0.011
60th		0.105	0.024	-0.005	0.000	-0.005	0.031	-0.017	-0.003	-0.024	0.033	-0.036	0.028	0.013	0.000	-0.015	0.049	-0.027	0.026	-0.025	0.014	-0.016	0.023
More than70		0.072	0.038	-0.029	0.000	0.003	0.026	0.004	0.012	-0.014	0.009	0.005	0.012	-0.005	0.001	-0.010	0.006	-0.009	0.011	-0.018	0.005	-0.007	0.028

The image of the surrounding area at this shopping street

The column/row categories of this matrix include: Heated, Stimulated, Open, Exclusive, Want to reside, Do not want to reside, Warm, Aloof, Fascinating, Not fascinating, Want to play, Want to examine (closely), Lively, Calm, Atmosphere of urban, Atmosphere of rural area, Gender (Male, Female), and Age (10th, 20th, 30th, 40th, 50th, 60th, More than 70).