

An Analysis of a relationship of the service level of bus transport system and the travel behavior

Kosuke MIYAZAKI,
Graduate School of Natural Science & Technology,
Kanazawa University,
Japan
Phone: +81-76-234-4615
Fax: +81-76-234-4644
E-mail: k_miya@stu.kanazawa-u.ac.jp

Keishi TANIMOTO
Department of Social Systems Engineering, Faculty of Engineering
Tottori University
Japan
Phone: +81-857-31-5310
Fax: +81-857-31-0882
E-mail: tanimoto@sse.tottori-u.ac.jp

Jun-ichi TAKAYAMA
Graduate School of Natural Science & Technology,
Kanazawa University,
Japan.
Phone: +81-76-234-4613
Fax: +81-76-234-4644
E-mail: takayama@t.kanazawa-u.ac.jp

Takehiro Kikuchi
Automobile Business Association of Aomori
Japan.
Phone: +81-17-739-1888
Fax: +81-17-739-1579
E-mail: takekiku@wonder.ocn.ne.jp

Abstract

This study focuses on the reaction of the residents during the social experiment of bus transportation service. According to AIDA model proposed in marketing, the reaction consists of several stages. We assume that the reaction in each stage is different from the person who lives where the service level was low and high before the experiment. Specifically, the person who lives where the service level was low does not react well because the service level has been too low to have concern for the bus service. We verify this assumption using the data from the social experiment conducted in Hiraka Town. As a result, this assumption is verified. Thus the disparity of the responsiveness in the service level before the experiment exists. We discussed that it is not fair to use the observed responsiveness for the information basis of the bus transportation service after the experiment because of the disparity.

Keyword

Social experiment, Public transport system, Daily activity, marketing, AIDA model

1. Introduction

The ridership of the bus transportation service in rural areas has decreased. This is because many households own private cars and enjoy daily life activities without public transportation services. Especially in rural areas, it is often the case that a household owns several private cars. The most of the bus users are non-car owners. Thus it seems to be hopeless to increase the ridership of the bus transportation service in rural areas. However, it is not so. According to the social experiment of bus transportation service conducted in Hiraka Town in Japan, remarkable increase of ridership has been found (Miyazaki et al., 2006). During this experiment, the level of bus transportation service was higher than before. However, the response is different between those who lived where the service level was relatively low and high before the experiment. It is a question in this study “Why could the difference be seen?”

We assume that it is derived from the disparity of the psychological process of using the bus in who lived where the service level was low and high exists. To investigate this assumption, AIDA (attention, interest, desire, action) model proposed in marketing is referred as psychological process. In AIDA model, the process consists of four stages. This study investigates whether the disparity can be seen in each stage.

2. A way of thinking of the AIDA model in this study

Table 1 illustrates the AIDA model (Furukawa et al., 2003) used in this study. This AIDA model can not be used for the maintenance-effect measurement of the public transport system. "Attention" expressed "A" of the first step is that the keyword of an evaluation index are the recognition ratio and the popularity. We evaluated it with knowing bus transportation system itself. "Interest" expressed "I" of the second step is that the keyword of an evaluation index are the product evaluation, the image and the brand preference. If the people decide whether or not to be able to use transport system, it is no good that he knows only existing the transport system. The information which can judge whether or not it is possible to use must be known. And this information must be gotten by him. So, we defined all four items of "home-nearest bus stop", "bus route", "way to use", "time" as the evaluation. "Desire" expressed "D" of the third step is that the keyword of an evaluation index are the purchase intention. We evaluated that at whether or not the going-out conation improved. "Action" expressed "A" of the fourth step, last step, is that the keyword of an evaluation index are the sales and the brand choice. We evaluated that at the demand of the bus transport system.

Table.1 An advertisement effect index of AIDA model (Furukawa et al., 2003)

A consumer reaction process	An advertisement effect index
Attention	A furtherance / Non-furtherance Recognition rate, The popularity
Interest	Article evaluation, An image, An election for brand Enthusiast
Desire	Purchase intention
Action	Sales, Brand choice

3. A summary of a social experiment

3.1 A summary of Hiraka-machi

The position of Hiraka-machi to have made a subject of research is shown in figure 1. Hiraka-machi is located in south of Aomori Prefecture, and that is south of Tsugaru-plains. The population is about 23,000 peoples. As for the great part with population, it lives in the western region in Hiraka-machi. Konan Railway is passing to Kuroishi station via Hiraka station, starting from Hirosaki station. This railway is operated in the interval of 30 minutes. The bus transport system network in Hiraka-machi in 2003 became a network centered on Konan Railway Hiraka station. In addition, the hospital bus operated 3 or 4 per day. This hospital bus is operated in Hiraka-machi whole area.

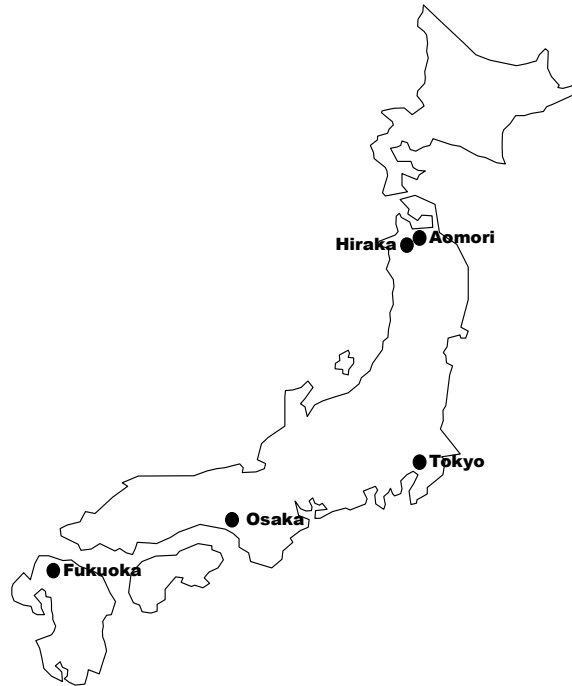


Figure.1 A position about Hiraka-machi, Japan

3.2 A social experiment

The Hiraka-machi circulation bus transport system began an operation on 2004 April 1st. In 2005 November 1st, it changed an operation timetable and the frequency. In 2005 April 1st, it changed an operation timetable and the frequency, too. In 2005 December 1st, it changed an operation timetable and the frequency, too. These processes were shown in table 2. Figure 2 is the Hiraka-machi circulation bus transport system route map. The name which is squarely enclosed in the figure2 is a main destination.

Table.2 The change of a service level of Hiraka-machi circulation bus transport system

date	frequency (per day)				A bus stop interval	A fare	Remarks
	A low-frequency district		A high-frequency district				
	Sugidate / Matsuzaki Line	Iwadate / Daibo Line	Araya / Osaki Line	Karatake / Hirohune Line			
Before April 1, 2004	0	4	8	8	About 500m intervals	The rate that accepted distance (¥140~¥410)	
April 1, 2004 ~	15	15	15	15	About 200m intervals	¥100(once ride)	It is changed in circulation type
November 1, 2004 ~	14	14	14	14	About 200m intervals	¥100(once ride)	Reverse setting
April 1, 2005 ~	4	4	8	8	About 200m intervals	¥100(once ride)	Reverse setting
December 1, 2005 ~	4	4	8	8	About 200m intervals	¥100(once ride)	Reverse setting

April 1, 2006 ~	4	4	8	8	About 200m intervals	¥100(once ride)	Reverse setting
-----------------	---	---	---	---	----------------------	-----------------	-----------------

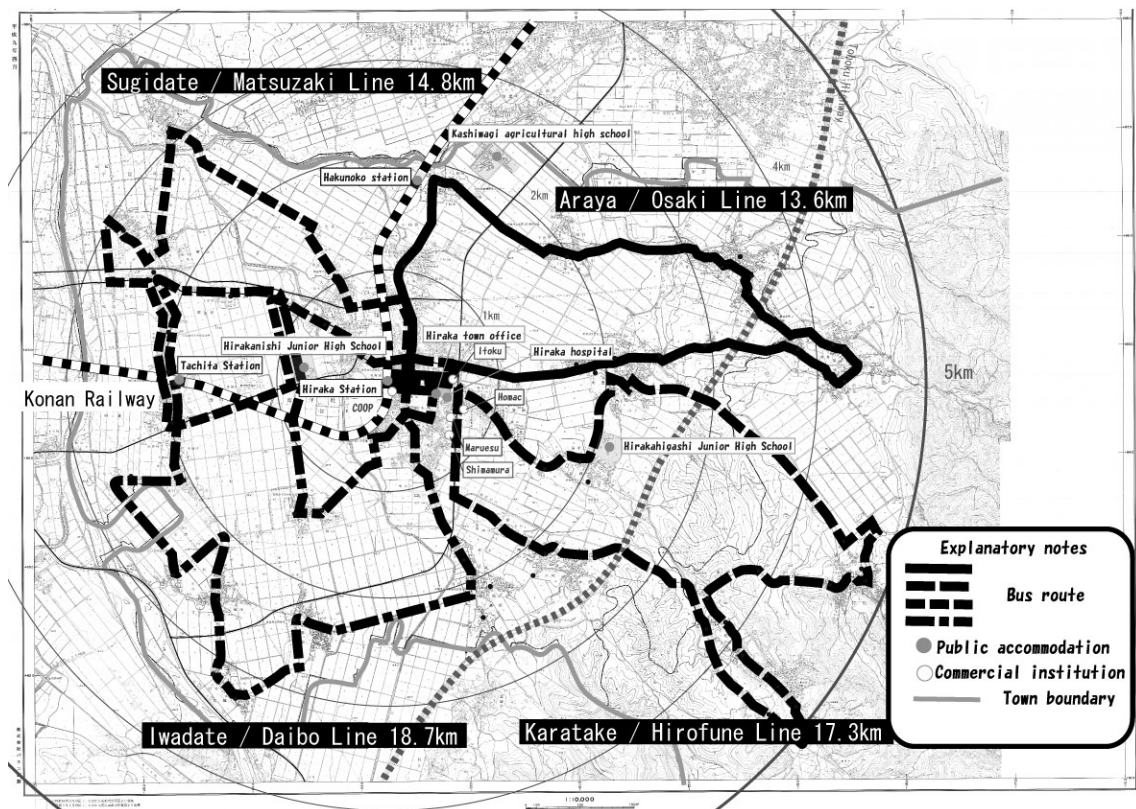


Figure.2 A route map of Hiraka-machi circulation bus system

The situation before society experiment is referred to the paper in Miyazaki et al. 2005. The details of the society experiment are referred to the paper in Kikuchi et al. 2006. In this paper, we show that there was improvement of the substantial services of the bus transport system in 2004. And, in 2005, there was decline of the substantial services of the bus transport system compared with 2004. We defined "the low frequency area" as the area where was made 4 per a day in 2005. So, these areas are Sugidate / Matsuzaki area and Iwadate / Daibo area. And, we defined "the high frequency area" as the area where was made 8 per a day in 2005. So, these areas are Araya / Osaki area and Karatake / Hirofune area. Since April, 2006, it is operated by the service level in 2005.

3.3 Questionnaire

In December, 2005, we implemented a questionnaire survey to the resident in Hiraka-machi. The question contents are as follows. The change of the traffic action at

the time of 2003 and the time of 2004, the change of the traffic action at the time of 2003 and the time of 2005 and so on. The investigation object household was 5913 households. The number of households which could be collected was 978 households. The rate of collection was 16.5 %. In addition, two votes at the maximum were collected by each household so that effective answer was 1,454 votes.

4. Factor analysis about "Attention"

4.1 A definition of the popularity

We assume "the popularity" of the bus transport system got ready as an evaluation item about "Attention" that is the first step of the AIDA model. In the questionnaire, we asked on whether or not it knows a wide range of items of "The Hiraka-machi circulation bus transport system". For example, "home-nearest bus stop", "cost", and so on. If the person knows only one item among these items, we defined the person knowing "the Hiraka-machi circulation bus transport system".

4.2 Construction of "the popularity" model

We built a model for analyzing what kind of factor of "the popularity" that we defined with 4.1 was affected. Therefore we built the model that assumed a ratio of the person who knew "The Hiraka-machi circulation bus transport system" as a dependent variable. In setting of an independent variable, we paid attention to the following points. About a personal attribute, we paid our attention for whether or not to be able to use the transport system about movement. We use the way of Miyazaki et al. (2005). It is "The use environment of the means of transport system". By the following way, we classified into three kinds of attributes. If the person can use the car free anytime, we defined him as "Owner-drivers group". If the person wants to go somewhere, he is able to be sent off anytime by someone. We defined him as "Pickup group". We defined the person who is not "Owner-drivers group" and "Pickup group" as "Public transport group". We distinguished between the aged people and the youth from whether or not the person depends on using the bus transport system. Moreover, we added the following item as a dependent variable. For example, sex, accessibility from home to home-nearest bus stop, a service level before the experiment, and so on. And we built the logit model.

$$y = \frac{\exp(\beta_i x_i)}{1 + \exp(\beta_i x_i)} \quad (1)$$

Here, it is y : The recognition degree

x_i : Explanation variable

β_i : A parameter

In addition, for an independent variable, we assumed the following items.

constant : Constant term

x_1 : Dummy variable

x_2 : Which becomes 1 if it is pickup group; Dummy variable

x_3 : Which becomes 1 if it is public transport group; Dummy variable

x_4 : Which becomes 1 more than 65 years old; Dummy variable

x_5 : Which becomes 1 if age is under 20 years old; Dummy variable

x_6 : Which becomes 1 if it is a man; Dummy variable

x_7 : Which becomes 1 if access time from home to home-nearest bus stop is under 3 minutes

x_8 : As a service level before the social experiment, it is a logarithm of frequency per day

Table.3 A definition of “The use environment of the means of transport system”

	The situation of a traffic environment
Owner-drivers group	The person who has the car which has a driver's license, and is usable freely.
Pickup group	He can ask for pickup without hesitation. And the person who does not have the driver's license or does not have the car which is usable freely even if he has a driver's license.
Public transport group	The person who is not "Owner-drivers group" and "Pickup group" .

4.3 Consideration of a result

An estimation result by the logit model is shown in table 4. The likelihood ratio became 0.201 and showed comparatively good conformity degree. We add consideration every explanation variable as follows. A senior citizen dummy value is showed highest t value. Furthermore, a young fellow dummy value became a significance parameter with probability equal to or less than level of significance 5%. We compare a parameter value about these simply. So, the ratio of the person knowing "The Hiraka-machi circulation bus transport system" as for the class of youth under 20 years old is higher. The older the person becomes, the lower the ratio of the person who knows it. It is “Public transport group” that show high t value successively. According to this, it followed that the ratio of the person who knew "The Hiraka-machi circulation bus transport system" so as to become “Owner-drivers group”, “Pickup group”, “Public transport group” is high. After all, the person who cannot but depend on the bus transport system for living on a day knows well about "Hiraka-machi circulation the bus transport system". It was hard to say when we looked with t value to be a very meaningful parameter, but, as a parameter meaningful next, it was a service level before

the social experiment. We express this with the thing, which took a logarithm of frequency per day before the social experiment. According to this result, we can express as follows. If a service level before the social experiment is lower, the ratio of the person knowing "The Hiraka-machi circulation bus transport system" is lower.

We understand that the ratio of the person who knew "The Hiraka-machi circulation bus transport system" depended on age and the use environment of the means of transport system. According to the t value, the difference of the recognition degree does not depend on the difference of the service level before the social experiment. However, compared with the other variable, it is possible to say that the difference of the recognition degree depends on the difference of the service level before social experiment.

Table.4 Result of popularity model

Variable	Coefficient	t value
Constant	0.9925***	5.013
Dummy variables of Pickup group	0.1669	0.779
Dummy variables of Public transport group	0.6998***	3.410
Dummy variables of Senior citizen	-0.9481***	-5.834
Dummy variables of young fellow	1.7497**	2.349
Dummy variables of sex	-0.0533	-0.325
Dummy variables of nearest bus stop	0.0376	0.250
Service level before the experiment	0.1298	1.550
Initial likelihood		-748.599
Last likelihood		-598.228
Likelihood ratio		0.201
Hit ratio		72.6%
Number of observations		1,080

***Probability equal to or less than level of significance 1%,

**Probability equal to or less than level of significance 5%

5. Factor analysis about "Interest"

5.1 The definition that the recognition to evaluate "Interest" is in a state

We defined "Interest" which was the second step of an AIDA model. It is the recognition of "The Hiraka-machi circulation bus transport system" with a way of thinking of Chapter 2. We defined to have the interest in "The Hiraka-machi circulation bus transport system" as to know all of the 4 items, "home-nearest bus stop", "bus route", "way to use", and "time".

5.2 Construction of a recognition degree model

Here, we built the logit model that assumed the ratio of the person who recognized "The Hiraka-machi circulation bus transport system" that we showed with 5.1 as a

dependent variable. In setting of an explanatory variable, we thought like 4.2.

$$yy = \frac{\exp(\beta_{yi}x_{yi})}{1 + \exp(\beta_{yi}x_{yi})} \quad (2)$$

Here, it is yy : The recognition degree

x_{yi} : Explanation variable

β_{yi} : A parameter

In addition, for an independent variable, we assumed the following items.

const : Constant term

x_{y1} : Dummy variable

x_{y2} : Which becomes 1 if it is pickup group; Dummy variable

x_{y3} : Which becomes 1 if it is public transport group; Dummy variable

x_{y4} : Age becomes 1 more than 65 years old; Dummy variable

x_{y5} : Which becomes 1 if age is under 20 years old; Dummy variable

x_{y6} : Which becomes 1 if it is a man; Dummy variable

x_{y7} : Which becomes 1 if time from home to a nearest bus stop is under three minutes

x_{y8} : As a service level before the social experiment, it is a logarithm of frequency per day

5.3 Consideration of a forecast

An estimation result by the logit model is shown in table 5. The likelihood ratio became 0.526 and 0.2 greatly, and showed high conformity degree. We add consideration every explanation variable as follows.

The person with the high ratio of the person who admits "The Hiraka-machi circulation bus transport system" is following person. It is "public transport group", and it is a young fellow, and a home-nearest bus stop is near to home. We arranged the characteristic every explanation variable next.

In turn the value of "Public transport group", "Pickup group", "Owner-drivers group" becomes small. This reason is as follows. The person who can not use a car freely depends on the bus transport system. Therefore, it is possible to read to be doing the information collection for using the bus transport system from the simulation result. In addition, the ratio of young fellow whom recognizes "The Hiraka-machi circulation bus transport system" is high, compared it with a senior citizen. Young fellow must go to school and so on everyday go out. And, this is because that for young fellow, the bus transport system is important for transportation, because he can not use the car freely. They are always thinking of whether or not it is possible to use the bus transport system

at any time. In addition, it followed that the ratio of the person who recognized "The Hiraka-machi circulation bus transport system" rose so that distance from home to the home-nearest bus stop was short. For this, it is thought that accessibility from home to the home-nearest bus stop becomes an important index. The higher the service level before the social experiment is, the higher the ratio of the person who recognizes "The Hiraka-machi circulation bus transport system" is. If service level of the bus transport system before the social experiment is low, there are many persons who give up the movement which used bus transport system. Even if the bus transport system with high service level is supposed, these people do not exist in the consciousness to move using the bus transport system.

Table –5 Result of recognition degree model

Variable	Coefficient	t value
Constant	-3.0599 ^{**}	-9.486
Dummy variables of Pickup group	0.4163	1.360
Dummy variables of Public transport group	0.9124 ^{**}	3.398
Dummy variables of Senior citizen	0.0299	0.130
Dummy variables of young fellow	1.0507 ^{**}	2.699
Dummy variables of sex	-0.0014	-0.006
Dummy variables of nearest bus stop	0.3432 [*]	1.673
Service level before the experiment	0.2252 [*]	1.712
Initial likelihood		-748.599
Last likelihood		-362.354
Likelihood ratio		0.5160
Hit ratio		88.8
Number of observations		1,080

^{**}Probability equal to or less than level of significance 1%,

^{*}Probability equal to or less than level of significance 10%

The cognitive degree to the bus transport system which was serviced more newly than the above depends on the service level of the bus transport system before service. Our supposition was supported.

6. Factor analysis for improvement of going out will

6.1 A way of thinking about activation of going out will and relations of a service level

Going out will is repressed by a low service level before the social experiment, and it is thought that the going out will that was repressed till then because this experiences a high service level by social, testing it is activated. And Tanimoto et al. (2007) analyzed about activation of going out will being big if the gap is big. In this study, we try that we support this theory by model analysis.

6.2 Construction of a model about going out will improvement

We limited to the person who recognizes the bus transportation which was proposed in chapter 5 and we built a model. We set the ratio of person whose going out will be improved at the time of low service level as a dependent variable after having experienced the high service level. For an independent variable, it was based on a way of thinking that was similar to 5.2 and, with the service level before the social experiment, the personal attribute, supposed logit model to show below it in.

$$yyy = \frac{\exp(\beta_{yyi} x_{yyi})}{1 + \exp(\beta_{yyi} x_{yyi})} \quad (3)$$

Here, it is yyy : A ratio of the person that going out will improved

x_{yyi} : Explanation variable

β_{yyi} : A parameter

In addition, for an independent variable, we assumed the following thing.

const : Constant term

x_{yy1} : Dummy variable

x_{yy2} : Which becomes 1 if it is pickup group; Dummy variable

x_{yy3} : Which becomes 1 if it is public transport group; Dummy variable

x_{yy4} : Age becomes 1 more than 65 years old; Dummy variable

x_{yy5} : Which becomes 1 if age is under 20 years old; Dummy variable

x_{yy6} : Which becomes 1 if it is a man; Dummy variable

x_{yy7} : Which becomes 1 if time from home to a nearest bus stop is under three minutes

x_{yy8} : As a service standard before the experiment, it is a logarithm of frequency per day

6.3 Consideration of a forecast

An estimation result by the logit model is shown in table 6. The likelihood ratios exceeded 0.274 and 0.2 and showed passable conformity degree. We add consideration every explanation variable as follows. The ratio of the person that "Public transport group" has going-out conation more than "Pickup group" showed a rising tendency. The bus transport system becomes convenient and that going-out conation is activated, because "Public transport group" cannot help depending on the bus transport system for. As a meaningful parameter, we pay our attention to a service level before the next experiment. This parameter shows a negative value. This shows that the ratio of the person having going out will is high so as to be low if the service level before the

experiment is low. In other words, this result supported the theory of Tanimoto et al. (2007).

Furthermore, a few person expresses that the ratio of the person having going out will rises with a senior citizen. As for this, as for the senior citizen, low service level of the bus transport system can be active in total to have time to spare, but, as for many people except a senior citizen, activity is limited in terms of time, and it is not possible for the activity that the person was able to put together to a low service level of the bus transport system. However, the activity used the bus transport system is improved by experiencing the bus transport system of a high service level, and the going-out conation rises. Especially, the ratio of the person who improved is more. And the tendency expresses that a woman is more remarkable than a man. On the other hand, about accessibility to home-nearest bus stop, we show that the ratio of the person, whose going out will is improved, is high so that, needless to say, accessibility is high.

By the way, because t value of the service level before the social experiment was low, here, it limited the person whom recognized and arranged the bus transport system, for figure 3 whether there was improvement of going out will. As a result, the ratio of the person that going out will improved in "Sugidate / Matsuzaki area" where was 0 of frequency before the social experiment is the highest with about 40%, and the ratio of the person who improved going out will in "Karatake / Hirofune area" where was 8 and this district maximum frequency before the social experiment lowers with about 15% most. On the other hand, a big difference is not recognized about 26% and these two districts, but "Araya / Osaki area" and "Iwadate / Daibo area" falling under a low-frequency district falls under about 28%, a high-frequency district shows the tendency that the ratio of the person that going out will improved rises so that there is little frequency before the social experiment. t value for a parameter value of a service level before the social experiment is not very higher than the above, but can judge a result to support an original supposition to have been provided.

Table.6 Result of model about going out will improvement

Variable	Coefficient	t value
Constant	-1.0417	-1.307
Dummy variables of Pickup group	0.5106	0.733
Dummy variables of Public transport group	1.6367***	2.597
Dummy variables of Senior citizen	-0.4945	-1.039
Dummy variables of young fellow	-0.4967	-0.916
Dummy variables of sex	0.4984	1.083
Dummy variables of neighborhood bus stop	-0.4434	-1.509
Service level before the experiment	-1.0417	-1.307
Initial likelihood		-83.8708
Last likelihood		-60.8734
Likelihood ratio		0.274
Hit ratio		73.6

※※Probability equal to or less than level of significance 1%

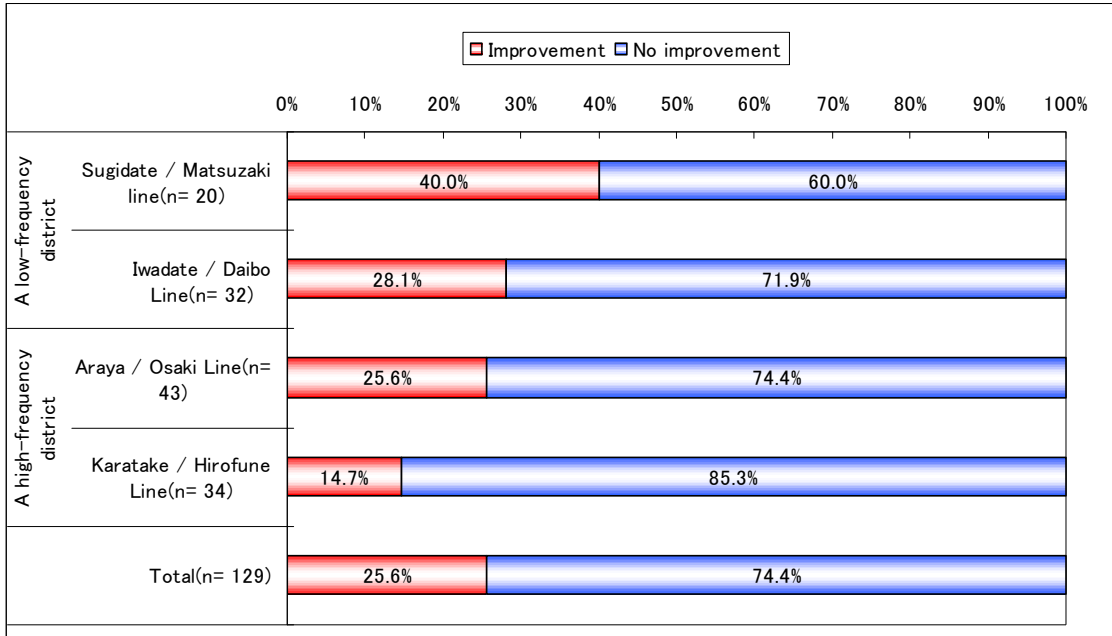


Figure.3 Ratio of the person that going out will of the person who recognized the bus transport system according to a route improved

7. A change of the demand according to a district

We evaluate "Action" which is the fourth step of the AIDA model with the demand for the bus transport system got ready. About the difference of the demand in "a low-frequency district" and "a high-frequency district", therefore, refer to Miyazaki et al. 2006. We pay our attention whether there is the difference according to a route here. The thing which we arranged based on the use results of "The Hiraka-machi circulation bus transport system" according to a route is figure 4. We arranged it in terms of day average user per one to perform comparison according to a route. In addition, in each year, we used data from April to November by performing comparison analysis with data of 2006 after full-scale enforcement and arranged it. As a result, because the service level in 2004 is same as each route, we can compare this figure simply. According to this, as for "Sugidate / Matsuzaki Line" falling under a low "low-frequency district", "Iwadate / Daibo Line" of the service level, the demand is

smaller than "Araya / Osaki Line" falling under a high "high frequency district" of the service level, "Karatake / Hirohune Line". And "Sugidate / Matsuzaki Line" where the bus transport system was not operated before the social experiment in "a low-frequency district" either compares with "Iwadate / Daibo Line", and the demand becomes small.

Furthermore, the service level is seen before the experiment when the service level watches it with different after in 2005 according to a district so that the demand for low "Sugidate / Matsuzaki Line" increases. In addition, on the other hand, we are seen so that the demand after in 2005 decreases about "Araya / Osaki Line" and "Karatake / Hirohune Line" where the service level was high before the social experiment.

We see it so that we have the difference for the demand of the bus transport system by the service level before the social experiment in particular from this result according to a district. It seems to become figure 5 and can consider the difference to watch the use environment of the means of transport system according to the district to confirm whether this is a thing by a service level so that there is not it.

From these results, it became clear about the demand in 2004 that there was the difference of the demand by the service level before the social experiment. In addition, the demand increases in comparison in 2005 after full-scale enforcement before the experiment slightly in "Sugidate / Matsuzaki Line" where there was no bus transport system. It is thought that this means that a rag namely a delay of reaction is in an appearance of an effect of the social experiment. There are many as for the research example about this rag effect in a field of marketing (Eliashberg et al., 1997).

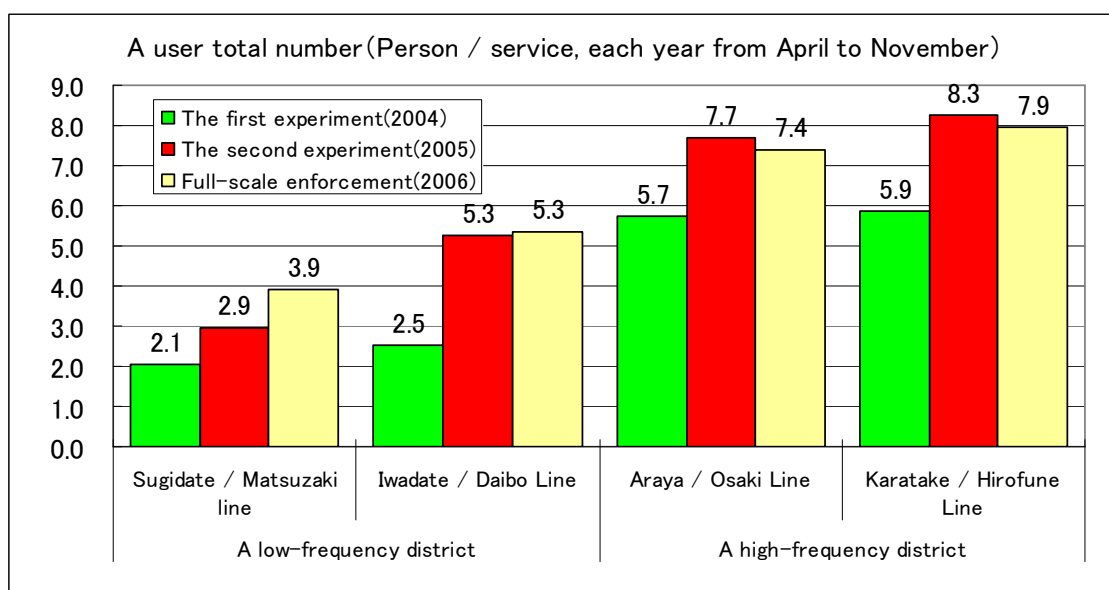


Figure.4 A change of user according to a route of "The Hiraka-machi circulation

bus transport system"

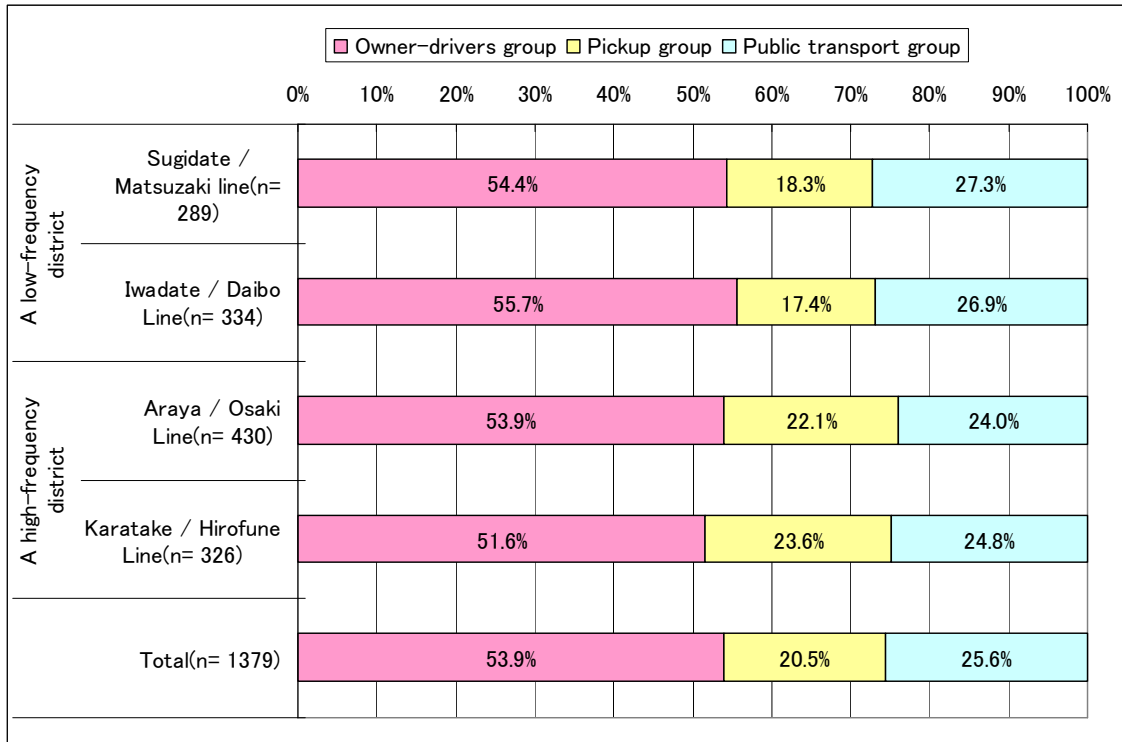


Figure.5 The use environment of the means of transport system according to a route of "The Hiraka-machi circulation bus transport system"

8. Conclusion

In this study when we got the bus transport system of a high service level ready in the area where the service level of the bus transport system was low, the difference caused by the difference of the service level before maintenance at each step in the AIDA model used in the field of marketing. As a result, in each step of the AIDA model, it was supposed that the difference can be caused by the service level of the before.

It followed that the recognition degree of the bus transport system after maintenance was low so as the difference was accepted in the recognition degree of the bus transport system after maintenance as for it by the difference of the service level of the bus transport system before maintenance. In addition, we intended for the person who recognized the bus transport system, and a result that the ratio of the person that going out will improved rose was provided so as the service level of the bus transport system before maintenance was low. And, we analyzed how the ratio of the person that going

out will improved because the bus transport system was got ready became, and we realized if the difference of the service level of the bus transport system after maintenance was big, the ratio of the person is high.

However, it became clear not to have awakening of the demand of the bus transport system in the short term, when it replaced "Action" of the fourth step of the AIDA model. And we considered it so as to be low if the service level of the bus transport system before maintenance was low. And, for awakening of the demand, it became clear that there was a rag namely the delay of reaction. As for this rag, the area where the service level of the bus transport system before maintenance was low was remarkable. We understood that it was hard to say that evaluation by the user volume as a maintenance effect of the social experiment was always good. On the other hand, at a point of view of improvement of going out will, an effect became clear. As a cause becoming such a factor, not doing expectation for the bus transport system as movement means is thought about in the area where the bus transport system is inconvenient. In other words it is thought that local inhabitants cope to be able to live under daily life without a hindrance without the bus transport system. To provide the bus transport system in the area where the bus transport system is inconvenient isn't wasteful.

In the area where the bus transport system being serviced becomes high, the ratio of the person that going-out conation was improved by limiting to the person who recognizes the service of the bus transport system. And, if there is more the difference of the service level between before and after, the ratio of the person that going-out conation was improved becomes higher. That is, it is clarified that to bring about the effect that the going-out conation is improving by servicing the public transport system. However, this effect does not appear at once. It is delayed and appeared. At the case in Hiraka-machi, this was clarified.

From this example analysis, it is rare that the maintenance effect appears as the public transport system demand in the short term, so as to be newly big by the social experiment and the public transport system. If the difference between the service level after maintenance and the service level before maintenance is big, it is clear. However, we thought that it appears "Action" of saying in the AIDA model as the public transport system demand by the device to be able to go ahead step of the AIDA model.

References

Eliashberg, Jehoshua., Lilien, Gary L., 'Handbooks in operations research and

management science' vol.5 : Marketing'

Furukawa, Ichiro., Moriguchi, Takeshi., Abe, Makoto. (2003) Introduction of marketing science, Yuhikaku Publishing, Japan (in Japanese)

Kikuchi, Takehiro., Miyazaki, Kousuke., Yoshiyuki, Tokunaga., Kita, Hideyuki., Tanimoto, Keishi., Takayama, Jun-ichi. (2006) 'The measure of the "Hiraka-machi loop-line bus" which created the increase of a bus user', Proceeding of Infrastructure planning, 33, CD-ROM(in Japanese)

Miyazaki, Kousuke., Yoshiyuki, Tokunaga., Kikuchi, Takehiro., Akira, Koeda., Tanimoto, Keishi., Kita, Hideyuki. (2005) 'An analysis of activity of elderly people in rural area', Infrastructure planning review, 22(3), pp.583-591(in Japanese)

Miyazaki, Kousuke., Tanimoto, Keishi., Takayama, Jun-ichi., Kikuchi, Takehiro. (2006) 'One consideration about an improvement of bus transport system service in a public transport inconvenience area', Japan Society of Traffic Engineers, 25, pp.265-268(in Japanese)

For example, Morita, Tetsuo., Nakamura, Fumihiko., Akimoto, Nobuhiro., Takahashi, Katsumi.(2001) 'An evaluation on experimental schemes through the regional initiative planning approach', Journal of infrastructure planning and management, 688(53), pp.63-73(in Japanese)

Tanimoto, Keishi., Miyazaki, Kousuke., Kikuchi, Takehiro., Kita, Hideyuki., Takayama, Jun-ichi. (Deployment decision) 'Influence of Level of Bus Transportation Service on Daily Life Activity in Rural Areas', Transport policy studies review(in Japanese)