FINANCIAL ANALYSIS OF THE SPECIAL TRANSPORT SERVICE IN JAPAN -COMPARING WITH THE PROVIDER'S EXPENSE AND USER'S WILLING TO PAY

INOI Hiroto
Graduate school of engineering of Osaka University, Suita, Japan
inoi@civil.eng.osaka-u.ac.jp

SUMMARY

Main topic of this paper is sustainability of Special Transport Service (STS) in economical aspect. It was surveyed the cost and the fare structure from a questionnaire for providers. And it was also surveyed user's amount of willing to pay (WTP) for the service from a questionnaire for users. There are quite a few corporations in which the transport cost is more than governmental rough standard that is half of the taxi price. As a result, many corporations hold deficit, which ends up being covered by the income from their other jobs.
The cost shown is higher than the price that users are willing to pay. Thus, even if no restriction is set regarding the price setup in STS, the expense will not be covered by just income and remaining anxiety will result in the project not lasting. Thus, we need to discuss the relation between users' burden and public assistance, thinking of how much users can pay. In addition, we ought to discuss the revision of the price standard and the necessity of public assistance based on the actual situation of transport expenses.
Key Words: Paratransit, Dial-a-Ride, Willingness to pay,

1. INTRODUCTION

Special Transport Service (STS) mentioned in this paper is similar with "paratransit" in USA or "Dial-a-ride" in Lodon. STS provides those who cannot use public transport with a high service level such as a door-to-door service. For that reason, it plays an important role in supporting the life of those who have heavily limited movement. Also, the social demand has been increasing year after year. Because of the revised Road Transportation Law in 2004, STS with which NPOs provide, began receiving the registrations as fare-paying transit by private car for mobility handicapped people. The register has been discussed at the management conference which conducted by local municipality. At the conference, taxi operators feel that the introduction of STS influence to their business, so the price setup is often discussed. The government has showed the rough standard of the transport price within approximately half of the upper limited price of the taxi in the concerned regions so that it can be a criterion that is not for profit-making. Many management conferences have followed this standard. On the other hand, the entrepreneurs of STS have pointed out that if the transport price is around half of the upper limited price of the taxi in concerned areas, the transport cost cannot be met, resulting in it becoming tough to maintain the management. The reason behind this issue is attributed to the lack of material on the expenditure structure of STS and the condition of income and expenditure balance. It is also attributed to the well-prepared materials on the management of taxi projects, enabling us to examine the system of STS based on the material of taxi projects.

In this paper, using Osaka Prefecture as a case study, we examine the sustainability of the project by grasping the management of STS. To be more specific, we will examine as follows:

- To grasp the expenditure structure and the income and expenditure balance.
- To grasp the amount that the service receivers will be willing to pay.

Then, to examine the necessity for supporting STS and to classify the drawbacks.

2. METHODOLOGY

One of the purposes of this study is to grasp the actual situation of STS. Several studies are carried out to study the actual management situation of the transport services provided by volunteers and others. Selecting Osaka Prefecture as the case study, Mihoshi et al. have investigated the actual situation of STS and grasped the income and expenditure balance of the project. The paper said that the private organizations such as NPOs need to be supported from administration. Also, Taniuchi et al. is examining the actual situation of volunteer transport carried by social welfare conferences and NPOs. The paper mentioned that 87% of them cover the deficit, using the money other than the price received from customers. However, these studies were conducted before the STS system started. It is also crucial to keep in mind that the nursing insurance which has a lot to do with the management of STS was revised in 2003. In a corporation for visiting and nursing users and a corporation for caring for users in their houses, the nursing reward from the administration used to be calculated based on the assistance for getting into and out of a car and service time. However, after the revision, because only the assistance for passengers getting into and out of a car became the subject being calculated, many corporations decreased the amount of nursing rewards. As a result, it is necessary to grasp the actual management situation under the current law system. Also, from the previous studies, it is predicted that quite a few corporations cannot organize a project if they have money only from the price paid by the users. Therefore, we will grasp the method of deficit compensation and money.

Next, we will talk about the research we have done to grasp how much users are willing to pay for the service. Some studies have mentioned the amount elderly people are willing to pay when they go out, they have also mentioned the relationship between the moving assistance policy and the activity of going out. However, this simple intention research about STS has been held to the question of ‘Do you think that the cost is expensive?’, something which few other studies have examined in detail. The STS price consists of the transport price and prices other than transport. Thus, in this paper, we will grasp the transport price; the amount that users are willing to pay towards the price, and the price other than transport; the amount that users are willing to pay towards the stand-by fare and the assistance fare for passengers to get into and out of the car. We will analyze the upper limited price of the taxi, the gap that users are willing to pay, and even the factors that affect the amount they are willing to pay.

3. THE PROBLEMS IN DECIDING THE STS PRICE

To implement STS, it is crucial to form the management conference in which a local government plays a major role. According to the guideline of MLIT (Ministry of Land, Infrastructure, Transport and Tourism), the conference “needs to be set to discuss the necessity of STS, the price received from the customers and the other necessary articles to operate STS with one’s own car.” Along with the actual circumstances in the regions, the management conference is an institution which decides the detailed rules for transport, composed of scholars, workers in STS and taxi workers in addition to the officers in local governments.

In particular, the way to cope with the price received from customers is a crucial topic that needs to be discussed. According to the MLIT’s guideline, the price setup needs to be “permitted within actual expenses”, “within a legitimate range that is targeted towards profit-making” and so on. More specific standards of the range is as follows.

(1) The transport price needs to be within the range of approximately half the upper limited price in the concerned areas

(2) The price excluding the transport price needs to be within actual expenses

However, the workers have pointed out some problems regarding the standards shown here by the management conference.

First, the STS workers have questioned that the range which is not targeted towards profit-making in regards to the transport price is legitimate at the range of half the price of the taxi. Due to the various reasons such as the regional situations and the size of the corporation groups, there are many workers' voices, saying that it is hard to maintain the service if the transport price is at the range of half the price of the taxi.

Next, it is assumed that calculating the range of actual expenses is difficult, in regards to the price setup other than the transport price. The target is those whose movement is limited, so there is waiting time in providing the assistance service for passengers to get into and out of the car and using the car to go to the hospital Thus, what we think about the standard of assistance fare and the stand-by fare have been discussed. However, the actual situation is that a specific idea has not been spelled out. For instance, at the management conference in Osaka, they permitted the stand-by fare and the assistance fare as the price other than the transport price. However, it requires an individual deliberation, resulting in keeping the specific price and the price setting unclear.

According to the management conference, it is reported that there are corporations that make a profit out of the nursing insurance of other projects and visiting cares. They use the profit for the compensation because the actual profit is of a deficit in the current price standard. As a result, the number of the new entry workers does not increase, leading to the anxiety that continuing the project is difficult. Therefore, we believe that we need to have a further discussion on the specific price setup, considering the information we have.

We have so far mentioned the present state of the price setup from the worker's viewpoints. On the contrary, there are other management conferences where the price setup has been discussed from user's point of view. Most of the people whose movement is limited are in an economical predicament. Thus, some of the corporations need to set the price far cheaper than half the price of the taxi. From the viewpoint of those who cannot use public transports such as taxis due to their physical and economical limits, there is the danger that they might lose transport methods if they cannot pay for the fare. For this reason, there are corporations that set the price cheaply even if it means they will not make a profit. However, in the case that they carry out the transport support despite having a deficit, there is an issue from the point of the project limit and continuity. We need to grasp the information on how much users are willing to pay, and then, we need to discuss the price setup and the management conferences about public support.

Not long has passed since STS started, many management conferences are insufficient and unclear about how the service price ought to be. However, STS should be able to provide a stabilized service as a project and spread out as transport methods for those whose movement is limited. Thus, the service price standard must be legitimate and not be an excessive burden on the various types of workers. Furthermore, the price should not be an excessive burden on those who cannot use the other transport methods. In order to live up to the above articles, the knowledge needs to be acquired to discuss the ideal method of the price setup. Namely, it is an urgent assignment to establish detailed information on the actual situation of the projects and on how much money the users are wiling to pay. Then, we must develop a discussion about how the price setup ought to be, including the support for STS among regional transports.

4. THE CIRCUMSTANCES OF STS

(1) The research concept

In order to grasp the price setting and the income and expenditure balance of STS in Osaka, a questionnaire survey was conducted to all 176 corporations who have a register in October 2007. The list of corporations is provided by Osaka prefectural government. The list is used for this survey is published in Sep 2007. Overview of the survey is shown below

TABLE 1 Over view of the questionnaire survey for STS operator

Delivering date	Oct.2007.
Calling back date	Nov.2007.
Way of delivering and calling back	Posting
Delivering number	176
Return number	83
Return rate	47.2%

Here, among the analysis which follows, regarding some of the data, there are many corporations that have not grasped the details of the corporations and the income and expenditure balance within a year after they began the projects. Thus, the number of valid responses is sometimes lower than the one shown in TABLE 1.

(2) The price setup

In terms of price, unlike most of the taxi corporations which have introduced the pay-by-the-time/distance system, many STS corporations have set either only the pay-by-the-time or the pay-by-the-distance system (FIGURE 1). This is perhaps because STS does not have a meter like a taxi and because STS lets the users see the price easily.

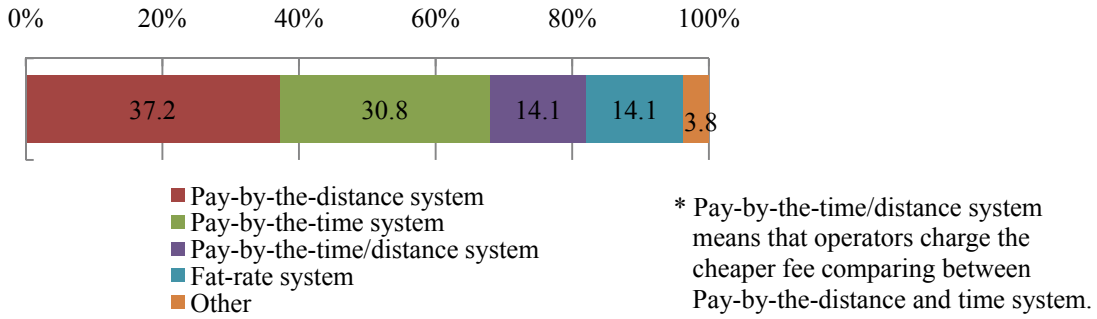

FIGURE 1 Type of fare system

As shown in FIGURE 1, the type of price varies from corporation to corporation. Even if they introduce the pay-by-the-distance system, the starting fare and the extra freight per certain distance are different from each other. For making a certain comparison, we set the time units or distance to be compared in each price system. Then, we calculated the price that is necessary to use the unit time and unit distance in the price system owned by the group. In the pay-by-the-time system, the median of the set unit time is 25 minutes. In the pay-by-the-distance system, the median of the set unit distance is 1.0km. Therefore, we set 30 minutes in the pay-by-the-price system and 1km in the pay-by-the-distance system as a unit respectively (TABLE 2).

TABLE 2 Fare system

	Pay-by-the-time system(for 30min).	Pay-by-the-distance system (for 1km)
average	¥742(30.3%)	¥96(32.8%)
means	¥750(30.6%)	¥100(34.1%)
standard deviation	¥248	¥35.5
First quartile point [Q1]	¥600	¥55
Third quartile point [Q3]	¥968	¥120

* ( ) show the rate towards the upper limited price of a medium sized taxi in Osaka prefecture.

** When making up Operator that has Pay-by-the-time/distance system, it is separated as two operator that have Pay-by-the-distance system and Pay-by-the-time system

In Osaka Prefecture, the rate towards the upper limited price of a medium sized taxi is a bit more than 30% in both the pay-by-the-time/distance system. This shows that the price is set far lower than half the upper limited price of the taxi.

The reason why the price setting is kept low like this is, according to the inquiry to the operators of STS, due to the actual situation that 'as a result of considering the users' economical situation, the price cannot be set high'.

Since the price of STS group is roughly set, the price of a part of the group would be higher than half the upper limited price of the taxi, especially in short distance tips. Judging from the actual use, however, the price is lower than half the price of the upper limited price of the taxi. Thus, the discussion on the price at the management conference was considered to be over sensitive.

(3) The income and expenditure balance of the project

We added up the responses separately because the major income of the project varies a lot from the corporations that collect the nursing rewards to the one that does not collect the nursing rewards (FIGURE 2). In the corporations that do not collect the nursing rewards, they collect the amount that corresponds to the nursing rewards from users, resulting in having the deficit compensation of approximately 40 percent. After asking the way to compensate the deficit, it turned out that the 95.6% of the deficit compensation amount is occupied by the internal compensation from the corporations.

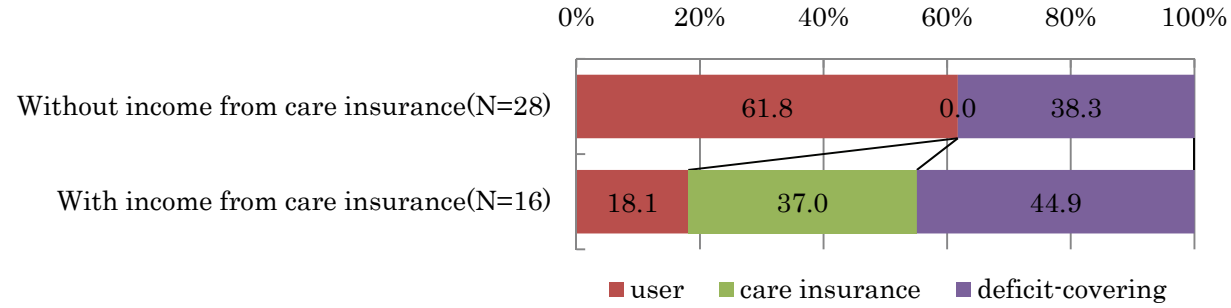

FIGURE 2 Major income's composition

Regarding the major expenditure's composition, the case in which the drivers are paid is greatly different from the one in which the drivers are unpaid. Thus, we added up the answers separately (FIGURE 4).

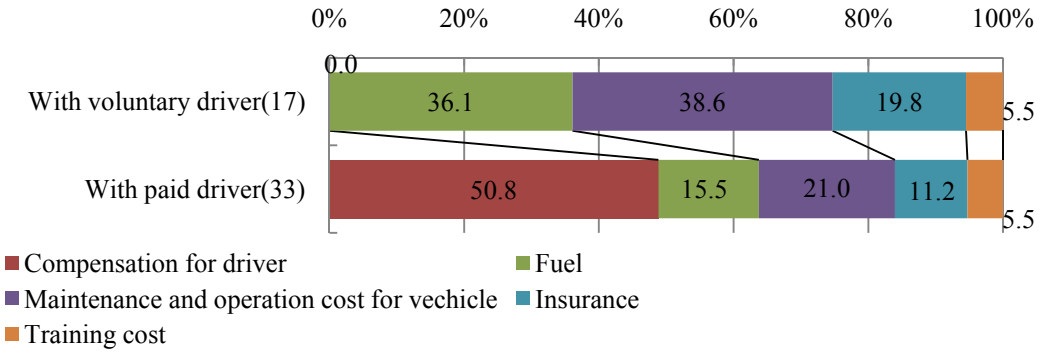

FIGURE 3 Major expenditure's composition

The expenditure in FIGURE 4 is balanced with the income shown in FIGURE 3, including the deficit. In other words, only around 60 percent of the expenditure is managed.

5. TRANSPORT COSTS

We have calculated the transport costs per drive. The cost changes depending on the distance and time. So, as shown in chapter 4, we set 30 minutes and 1km as a unit time and unit distance respectively.

In operational expense, it is difficult to calculate the expense per drive. Thus, we multiplied the income per drive, namely the price by the reverse rate of one-year income and expenditure, resulting in the transport cost per drive. Here, the rate of income and expenditure is given by the addition of the income from users and nursing rewards, divided by the amount of expenditure. The amount of expenditure is equal to the sum of income, which is the addition of the following; the income shown in FIGURE 3, nursing rewards and the amount of deficit compensation. These relations are shown in the FORMULA 1.

$$C_u = P_t \times \frac{E_y}{I_y}$$ ---------- (FORMULA 1)

C_t : Cost per unit
P_t : Fare
Iu_y : Income from user per year
D_y : Deficit-covering per year

From this, we calculated and added up from every corporation. (TABLE 3)

TABLE 3 Cost

	Pay-by-the-time system(for 30min).	Pay-by-the-distance system (for 1km)
Average	¥2,423(99.1%)	¥289(98.5%)
Means standard deviation	¥1,712(70.0%)	¥141(48.0%)
First quartile point[Q1]	2,181	317
Third quartile point[Q3]	¥850(34.8%)	¥100(34.1%)
	¥2,861(117%)	¥350(119%)

* ( ) show the rate towards the upper limited price of a medium sized taxi in Osaka prefecture.

From the standard deviation, Q1 and Q3, the price gap is great in every corporation, but both the mean and the median are greater than half of upper limited price of the taxi. In short, even if you set the price just under the upper limit price, deficit would arise.

6. HOW MUCH USERS ARE WILLING TO PAY FOR THE STS SERVICE

(1) The model presumption of the amount that users are willing to pay

In order to grasp the amount that users are willing to pay for the service, we carried out questionnaires of those who use 16 corporations in Osaka Prefecture in October and November 2007 .

TABLE 4. Data of the questionnaire survey for STS user

Delivering date	Oct.2007.
Calling back date	Nov.2007.
Way of delivering	Handover at using
Way of calling back	Posting
Delivering number	250
Return number	64
Return rate	25.6%

The questions are 'the price in pay-by-the-time (per 30 minutes)', 'the price in pay-by-the-distance (per one kilometer)', and 'the stand-by fare (per 30 minutes)'. In terms of the users who receive an assistance to get into and out of the car, we asked how much money they are willing to pay for that per time. We employed the double-bounded-binary-choice method for the questioning method (FIGURE4). For canceling bias from presentation order, combination of mount of money ((T), (TU) and (TL)) change randomly. The combination of amount of money that users are willing to pay is shown in TABLE 5.

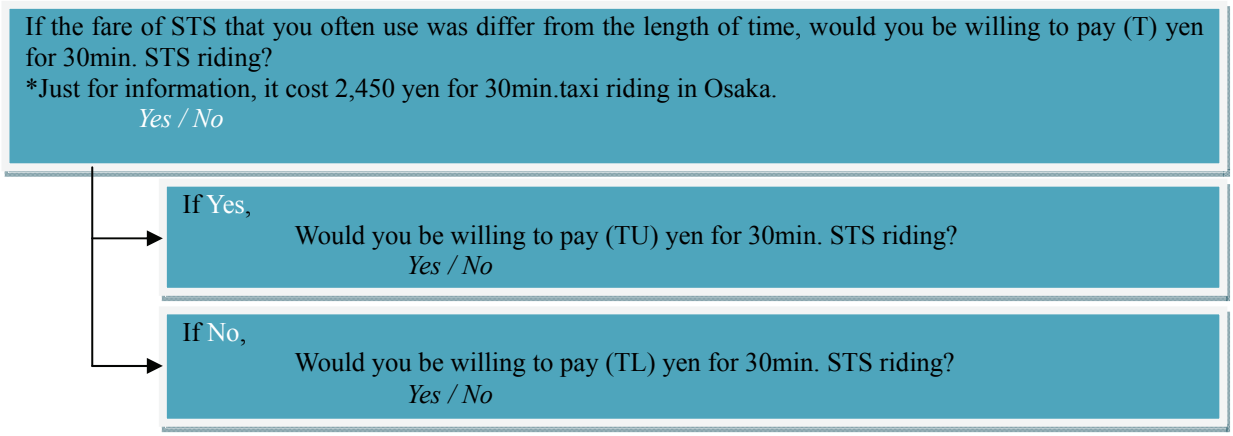

TABLE 5 The combination of amount of money that users are willing to pay

Combination No.	Fist presented (T)	Second presented for higher people (TU)	Second presented for lower people (TL)
1	1 * Taxi fare	1.5 * Taxi fare	2/3 * Taxi fare
2	2/3 * Taxi fare	2 * Taxi fare	1/2 * Taxi fare
3	1/2 * Taxi fare	2/3 * Taxi fare	1/3 * Taxi fare

To presume the amount of money that users are willing to pay, we consider users characteristics such as their 'service while using STS', 'purpose of use', 'frequency of taxi use', 'economic situation', and so forth. Referring KURIYAMA(1999) , Contingent Valuation Method (CVM) is selected as the way to presume the amount of money that users are willing

to pay. And to express the explanatory variation for the amount of money that users are willing to pay, the logarithmic logit model has been used (FORMULA 2).

$$P[Yes] = \frac{1}{\left(1 + e^{-\Delta V}\right)}$$

---------- (FORMULA 2)

$$\Delta V = \alpha + \beta \times \ln(T) + \Sigma(\gamma_i \times x_i)$$

T:Amount of money (Yen)

x_i: explanatory variable

α, β, γ : parameter

For the explanatory variation, we consulted 6 variations (TABLE 6).

TABLE 6 Explanatory variations for logarithmic logit model

	explanatory variable(xi)	item
γ_1	Type of vehicle used STS	Vehicle equipped slop or lift etc.
		Normal vehicle
γ_2	The presence or absence of Assistance service taking in and getting off	presence
		absence
γ_3	The presence or absence of using STS for hospital	presence
		absence
γ_4	The presence or absence of using taxi with care.	presence
		absence
γ_5	The presence or absence of using normal taxi	presence
		absence
γ_6	Household income	making life difficult
		making life not-difficult

We have included the explanatory variation of which the significance level is less than 5% in the end and we have also conducted a model presumption.

Regarding the factor that affects the amount of money users are willing to pay, as it becomes tough to make both ends meet, the amount that users are willing to pay decreases in all prices. For calculating the logarithmic logit model, the tool that provided by KURIYAMA (2007) was used.

TABLE 7 Result of calculation of logarithmic logit model for willing to pay

Pay-by-the-time system(for 30min).				Pay-by-the-distance system (for 1km)			
item	coefficient	t-test		item	coefficient	t-test	
α	37.3456	6.928	**	α	21.1310	5.473	**
β	-4.8758	-6.511	**	β	-4.0911	-5.522	**
γ_1	2.4897	2.548	*	γ_4	1.6831	2.832	**
γ_2	-2.2057	-2.913	**	γ_5	1.3693	2.278	*
γ_3	-2.4996	-3.461	**	γ_6	-2.4491	-4.319	**
γ_6	-2.7746	-4.326	**	-	-	-	-
log likelihood	-61.872			log likelihood	-62.673		
N	61			N	60		

* means that coefficient is significant from 5% t-test.

** means that coefficient is significant from 1% t-test.

Regarding the price in pay-by-the-time system, if the type of car is for welfare, it has a positive effect. Also, utilization for commuting to a hospital and those who receive the service for getting into and out of the car have a negative effect. This is probably due to the influence of the stand-by fare and the assistance fare for passengers to get into and out of the car.

About the pay-by-the-distance system, taxi users had a positive effect possibly because of the comparison of taxi services and the price.

(2) The presumption of the amount that users are willing to pay

Using the presumed model, we calculated the amount of money that users are willing to pay and showed it in TABLE 8.

TABLE 8 Willing to pay for STS service

	Pay-by-the-time system(for 30min).	Pay-by-the-distance system (for 1km)
Average	¥817(33.3%)	¥217(74.0%)
Means	¥762(31.1%)	¥203(69.3%)
First quartile point	¥955(39.0%)	¥265(90.4%)
Third quartile point	¥608(24.8%)	¥155(52.9%)

* ( ) show the rate towards the upper limited price of a medium sized taxi in Osaka prefecture.

In the case that we assume the price in the pay-by-the-time system, the amount that users are willing to pay tends to be much lower than half the price of the upper limited price in the taxi. On the other hand, in the case that we assume the price in the pay-by-the-distance system, the amount is higher than half the price of the upper limited price in the taxi. This would result from having many respondents who assume they will only move a short distance. If people think like that, their burden would be mitigated, thinking that the amount they are willing to pay is cheaper in kilometer units rather than in 30 minutes units.

7. SUMMARY AND CONCLUSIONS

In STS, the price is lower than the current price standard. It was assumed that the price is set for a low-income person in terms of the amount that they are willing to pay. However, there are quite a few corporations in which the transport cost is more than governmental rough standard that is half of the taxi price. As a result, many corporations hold deficit, which ends up being covered by the income from their other jobs.

The result of TABLE 3 and 8 shows that the transport cost shown in FIGURE 3 is higher than the price that users are willing to pay. Thus, even if no restriction is set regarding the price setup in STS, the expense will not be covered by just income and remaining anxiety will result in the project not lasting.

From now on, if the amount that corporations can assist decreases, it would be difficult to continue the project. Also, it is highly likely that new corporations do not increase. Therefore, a scheme is necessary to stabilize the income and expenditure of the project.

Besides, in a management conference and the like, the necessity of STS has been discussed from the two points. One is from the amount that taxis and others can supply. The other is from the number of people who have limited movement. Despite these circumstances, STS is considered as an important method to move around even for those who have limited access to taxis (including taxi which is operated using the slop or lift equipped vehicle) due to

economic reasons. Thus, we need to discuss the relation between users' burden and public assistance, thinking of how much users can pay. In addition, we ought to discuss the revision of the price standard and the necessity of public assistance based on the actual situation of transport expenses.

ACKNOWLEDGMENT

I would like to thank Mr. Yuichiro MORI (graduated student of Graduate school of engineering,Osaka University), because he play a main role of this research, making questionnaire sheet and analyzing the data. And I would like to thank STS operators too, because they spare the time for answering questionnaire in busy days.

REFERENCES

Kouichi KURIYAMA, Environmental Value and Valuation Method.: Hokkaido University Press., Sapporo Japan, 1999. (in Japanese)

CVM presuming Program using Excel. Kouichi KURIYAMA, Waseda University School of Political Science and Economics, Tokyo Japan.
www.f.waseda.jp/kkuri/workingpaper.html. Accessed Jul. 30, 2009.