

도덕적 해이로서 공익적 성격의 버스운송 체계

- 여수 시내버스 사례에 대한 게임이론적 접근

이무성*

Quasi-public operating Bus nature of the public interest as a moral hazard

- Game theoretical approach as the Yeosu area cases

Moo-Seong Lee*

요 약

완전 공영제의 전단계로 준공영제로의 과도기로서 지역별 사례들도 연구과제로 극히 제한적이지만 일부 발표되고 있다. 그러나 이에 대한 보완방법으로 전자정보 통신시스템에 의한 도덕적인 해이를 제도로서 최소화할 수 있어 본 논문에서는 전자정보 체제의 접목의 방법과 준 공영제 도입에 따른 안전에 초점을 맞추고 여수 지역을 구체적인 사례로 논지를 전개 해 나갔다. 사회적인 자산의 공공적인 관리로서 버스의 안전운영에 대한 문제점들도 개선들도 부분 언급하였다. 대중교통수단으로서 버스가 조세로서 지원을 통해 운영됨으로써 공익적인 감시체계를 통하여 지역주민들의 사고로부터 보호라는 안전망의 확보들도 크게 요청되고 있는 실정이다. 준공영제의 경영형식을 통한 현장에서의 성공적인 모형으로 창출을 위한 제안도 덧붙였다.

ABSTRACT

As examples of the region's transition to quasi-public goods a previous stage of full public goods also extremely limited in research. However, in this way can it compensate for this paper as a system to minimize moral hazard by electronic information and communication systems focused on safety in accordance with the methods and gave public goods introduction of grafting of electronic information systems played the Yeosu area to specific cases I went to the deployment.

키워드

Game Theory, Industrial Safe, Quasi-Public Operating, Moral Hazard, Public Good(s)

게임이론, 산업안전, 준공영 운영, 도덕적 해이, 공공재

1. Introduction

Character as public goods that have emerged with respect to the bus. In some areas, it is giving it complement the defect portion according to bus operation as part of the residents of the tax. It is a

kind of Quasi-public personality[1].

Quasi-public buses can increase the efficiency as compared to that calculated through the commitment of enterprise efficiency based on the public nature of public transport[2].

Entrepreneurs are responsible for Quasi-public

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operations as private operators, such as import tariffs are revenue of the travel route by integrating the co-operation council generally allocated according to the distance traveled and fare income[3-4].

The deficit as a loss of integrity is how the fare revenue shortfall if the route that runs not on local government spending preserve the balance in full.

Complete with a transportation system is an important element of urban functions. Because social and economic activities to be considered a means of urban transportation.

Such as income levels rise in people's private life appeared as a commodity in public transport services which do not meet the people's needs, which is a continuous decrease in the current social conditions of the users of public transport and public transport management aggravate the side effects of enlargement Castle It has caused.

Car traffic is the heart of the system to limit even go short for right-of-way of increasing social and economic costs of traffic congestion, etc., and sparked yet another social problem of human rights violations[5].

The social costs are reduced and the time required, such as Quasi-public discussion on various forms of public transportation systems in order to ensure the rights to move to other with a safety.

In particular, the Quasi-public operation system is already done in some areas and the limits of public spending, but also should be a priority target in building a mass transit system to ensure the safety and rights of way qualitative enhancement of the user.

The Quasi-public operation system is a social asset as Public concepts introduced through the strengthening of public management and passenger operations of its residents to move to other area with a safety with respect to the bus routes that purpose[6].

Local governments have introduced a specific purpose of Quasi-public operation intended to strengthen its role and responsibilities to focus public attention on the social infrastructure of bus operations improved the quality level of the bus.

Quasi-public operation can get a reasonably equipped to maximize the satisfaction of customers, residents and used as a management improvement target of improving public transport services, including transport companies post management system, such as through the interception of a fundamentally moral hazard¹⁾ .

However, follow-up system can be an enormous waste of taxpayers' money citizens have a moral hazard when loose[7-9].

Those concerns are being conducted based youngje reality is generated from the Quasi-public operation of Masan, Changwon areas.

The city is responsible for the Quasi-public operation related to specific policies bus and Development Council, and due to the lack of a functioning bus proceeds from the Management Committee.

Quasi-public operation²⁾ is a public good and should be completed in the public interest, and its policy priority in the stable operation and improve the residents' quality improvement in transparency based on a bus.

In many areas, including Yeosu area, companies are focusing their attention as a naturally safe operation of the bus as public ownership, not ownership of the company.

As public transportation is a situation where the bus is secured in the safety nets that protect the residents from the area of the accident it is also

1) The side with the information on the hidden action is a problem refers to a situation, they tend to take action against the side not having the benefit of the information.

2) as a good reference "A General Framework for Analyzing Sustainability of Social-Ecological Systems" by Elinor Ostrom, a Nobel Prizer in economics,

being requested largely via the public interest by operating surveillance systems through the support as a tax.

If you are creating a successful model in the field of management over the format of Quasi-public operation, there is almost no situation.

This is part due to the moral hazard of the persons interested.

The problem with other groups in the area that is being implemented. As difficult objective estimates of cost-effectiveness, lack of affordable transportation cost application method, the burden falls largely on fiscal management efficiency of the bus companies are weighted so on.

Unlike other transportation means, bus has a limit in comfort and in speed emerging as a critical point. As an additional problem in the ongoing departure, a bus traveling speed chronic deficit of the hard work of the match ends meet deteriorated, dull and increased enforcement, including the bus Quasi-public operation for accidents caused by aging, such as boarding of customers for a bus ride of users. Details are to be considered.

This paper attempts to analyze the concentration of safety problems for people in terms of game theory, focusing on The continuing review of Yeosu has been conducted, for example, 'local public transport services, basic planning the final report "Introduction of required resources for the Quasi-public operation through the ordering, management and evaluation systems(BMS, BIS, Rating System, Accounting Information System). This was complemented by a public hearing of the proceeding and to turn to.

In the case of Yeosu and bus companies, except for urban areas Quasi-public operation conducted three companies subsequently completed. Unlike many companies are scrambling by other municipalities, there is no great difficulty.

I just question the substantial additional funding and debt of the current bus company in accordance

with an exemplary amounts have emerged as a challenge.

Typically, game theory is predicting the end of the action in relation to the different interests and illuminating the relationship as an act other one is to maximize their profits.

Recently many activities have been described as a useful tool for analyzing the behavior of persons interested, they are opposed to each other.

Persons interested as bus transportation company are shipping company owners, members (shareholders), employees as bus drivers, executives, government and can be divided into passengers.

Each of the person interested as a valuable goal to pursue some opposition and some will also match their interests.

That common goal is to maximize efficiency by the kind of economic rationality principle that the best yield compared to input.

Looking into it in detail.

The owner is committed to minimizing the monetary amount you wish to continue enjoying their ownership as their own control.

It will maximize their management and maintenance of extending the period during which to receive its complement on and on.

The bus driver will have to minimize the commitment of time and labor intensity to his committed work force and wages and social welfare benefits such as maximizing benefits as opposed to it as stable job.

In the case of governments in managing the bus companies to invest a certain portion of budget support has minimal deposit to support the bus company and to maximize residents' convenience use.

Residents are each seeking safety and convenience. The problem is to maximize the actors understand their respective interests as moral hazard out while using the characteristics of

quasi-public nature of administrative surveillance.

Each characteristic is that they appear as a hidden hazard that appear to act after the agreement greatly undermine consumer waste and safety as a passenger in the budget.

Station selection information generated in the economics to be considered at the same time.

Other interested parties of the contract before due to the one-sided information from a hidden attribute information hypertrophic layer is to take the service and poor safety level of the middle or less[10].

Especially if the majority of residents use the bus stands are a number of pieces followed by additional social way to ensure their safety will not always be safe from exposure capture.

In this paper, as a way to minimize the moral hazard of each stakeholder in the center I want to deploy the safety and narrowed its argument. Quasi-public operation of the Yeosu area to promote it.

II. The main subject

2.1 Research Model

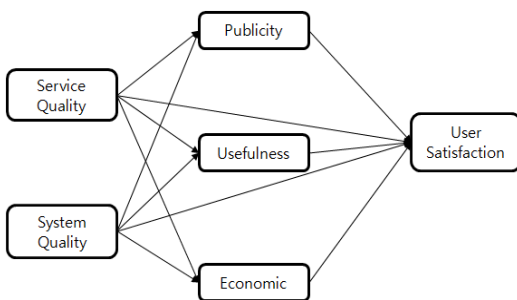


Fig. 1 A Research Model

Research models are the U- transportation service quality factors of service quality and quality

systems in order to design a research model shown in Figure 1 as information established through the existing literature on the basis of hypotheses as an independent variable, publicity, availability, affordability parameters variable, the user was satisfied with the respectively set as a dependent variable.

Regression equation shown in equation (1) to (5).

$$Y_1 = a_1X_1 + a_2X_2 \tag{1}$$

$$Y_2 = a_3X_1 + a_4X_2 \tag{2}$$

$$Y_3 = a_5X_1 + a_6X_2 \tag{3}$$

$$Z = c_1X_1 + c_2X_2 \tag{4}$$

$$Z = b_1Y_1 + b_2Y_2 + b_3Y_3 \tag{5}$$

Here, X_1 is quality of service(Service Quality),

X_2 is quality of service(System Quality),

Y_1 is Publicity

Y_2 is Usefulness

Y_3 is Economic

Z is User Satisfaction

$a_1, a_2, a_3, a_4, a_5, a_6, b_1, b_2, b_3, c_1, c_2$ Is the regression coefficient[10].

2.2 The conflicted interests seen as a game theory of conflict of interest

As seen above, strategies for game plays are complicated. in a game theory.

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Table 1. Generalized Game tree Solution algorithm

```

def gt_eval_rand(u):
    'Returns true if this node evaluates
    to a win, otherwise false'
    if u.leaf:
        return u.win
    elif u.op == 'OR':
        for child in
            random_order(u.children):
                if gt_eval_rand(child) == True:
                    return True
        return False
    elif u.op == 'AND':
        for child in
            random_order(u.children):
                if gt_eval_rand(child) == False:
                    return False
        return True

if S = game for players x, i=strategies,
\forall i,x_i\in S_i : f_i(x^*_i), x^*_{-i})
\geq f_i(x_{-i},x^*_{-i}) ... Simplified Formula
for Nash equilibrium
    
```

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2.3 game theory approach between owners(shareholders) and people

Generally, bus transportation company is taking the form of Commercial Companies on the form. As a human on the Company Law, the partnership, Joint-stock company, the company as a physical Co., Ltd.. and that is divided into an intermediate form of limited liability companies, such as five.

But there is more to this decision ever done an extremely closed organization forms its family-run business is undemocratic and not transparent.

At the same time market entry into a bus company also it is high, then the barrier is abnormal, withdrawal of state companies is almost unfulfilled by the competition.

This is the central bus drivers organized into unions, but that is hardly limited to the treatment of items of interest to improve working conditions such as wages are always pushed in a situation in which the people's safety is a priority that is not linked to working conditions.

Consumer residents can exclude the bus operating on a specific route as supply goods sovereignty is difficult to expect its structure. Yeosu case of bus companies to introduce a Quasi-public operation to cases that have occurred randomly skip the installation or operation of the bus stop to bus companies have been waiting a long time to wait for the bus in the right place.

Maintenance of stable operations in Yeosu are with prior consultation for bus at a time is a situation that can not be greatly expected.

<Formula 1-cost plus method>³⁾

$$\begin{aligned}
 u &= y - c(e) + s - g(e) \\
 &= y - c(e) + (c(e) - y) - g(t) \\
 &= -g(e).
 \end{aligned}$$

2.4 game-theoretical approach between residents and drivers engaged in bus companies

If you collect people's opinions based on people's needs and concrete benefits in the field of articles you want to transfer to the management of this bus companies to ensure the safety of the bus, the inhabitants of the requirements is to have a greater interest in their working conditions. It can not properly transmitted.

Granted been passed in some areas through literacy training and continuing education are being done, but the government ignored their demands even if the placenta because they struggled to come back to work extra weight of the driver.

In particular, additional tax even be caused by factors rather than wasting even through a mutual relationship with the collusion of checks and balances as a bus company owners and executives do not operate according to the introduction of the Quasi-public operation incomplete.

The basic full completion of Quasi-public operation occurs even if it executives and the bus driver were inflated as much as possible to preserve the structural deficit to be introduced as a deficit such as its total revenue minus total expenditure on ordinary one years as a period of time divided by the difference between having illegitimate.

In this case, as the amount of executive stake-holders, the bus driver should form a suture of the same alliance as stake-holders.

3) C. Yang, "A Study on the Bus Quasi-Publik Operation System : Incentive Perspective", 220..

<Formula 2-Fixed amount method>4)

$u=y-c(e)+s-g(e)$ $=y+s-c(e)-g(e)$

2.5 game-theoretical approaches between local governments and residents

Local governments set a minimum of inconvenience to the inhabitants of complaints occurring as primary objectives of internal and residents are to raise the level of service quality and safety of the bus company operates through an active role of local governments.

However, after the agreement of the bus companies are hidden deliberate actions as protrudes service quality or results of operations of the bus company, rather than people's expectations for safe driving on the legitimacy of the executive for the preservation of the deficit is a primary concern and focus.

This is an elected local government head and quantitative understanding of such as securing favorable position in the next election of lawmakers are intertwined naturally derived there.

You can find already Quasi-public operation or its corresponding system to easily practice them, etc. Masan, Changwon areas have been introduced in operation.

Focusing on some Quasi-public operation, the NGOs in Yeosu is most concerned that part of the bus with respect to the was based on the behavior of elected politicians Game Theory cases occurred in different areas.

III. Adjustment of conflict of interest through the use of Information and Communication

3.1 cases of conflicts of interest

For the purpose of increasing the safety and convenience of residents of the bus in Masan, Changwon and some areas have been expected from the implementation and also the fact that it went on actively enforced or review stage in Gwangju and Yeosu and other local governments.

However, initial expectations, which slowed the spread of Areas unlike the biggest obstacles to the mutual distrust of deficit calculation.

Arithmetic value of 'total revenue - total expenditure = deficit' in a period is the estimation.

Calculated as the excess of the imaginary legitimacy of that expenditure and spending on total spending, there are concerns about the under-estimation of revenues still taking place in disbelief.

In the case of import it shall be separated as boarding fees and advertising rates and revenue inflow of the owner of the passengers.

For boarding rates on the bus card, a credit card, it is the ratio of the calculation system and the automatic cash bound by contact, such as mobile phones continue to shrink the receipt amounts, it has been relatively accurately calculated.

Due to the lack of previous information system, bus drivers, etc., I can almost grab the middle of accuracy and reliability caused by the level of that amount is significantly higher.

In the case of advertising revenue it has been calculated that the amount under this section in conjunction with committed budgetary support to lower the ratio to be identified as illegal when applied without exception or even vocational schools etc. due to the rebate and advertisers' one-strike out ', the same case may be carried out as a complement to extremely strict exit in the event of an irregularity, even once.

4) C. Yang, "A Study on the Bus Quasi-Public Operation System : Incentive Perspective", 221..

It just is a problem in the case of a plethora of spending. In fact, the biggest beneficiaries of the Quasi-public operation bus driver.

In reality, however, there may be mentioned beneficiaries as more executives. The salaries of executives as a management salary system is set too high compared to the difficulty of their job role or a substantial portion of the deficit stems from moral hazard management. Owners need to check the executive (shareholder) is understood as those owned by not separating their management role has been almost equated.

When the job by National Competency Standards (NCS) analysis with respect to these payments to devise the average salary levels in the public can understand, it can be solved.

The bus drivers had a lifetime job stability as a priority.

Executive and articles of collusion when they occur legally enforced public interest outside auditors and the internal control system to prevent occurs if the union which consists of a central inflate the amount of money that is supported by mutual collusion conspiracy cases like the previous incorrect probability can also be lowered significantly.

In order to increase the level of safety and quality of passenger service further complements the current residents as bus arrival system, which spread to the national level, if you build a system of regular monitoring of information within the scope without departing from the scope of human rights violations be easily resolved can.

Just look at a previous moral hazard giving the public the wrong understanding by linking it with strings-attached game theoretical approach to substitution by private interests together with the bus companies and the cultural practices of the bureaucracy does not form the soil of social rationality As a punishment only partially effective only be expected.

3.2 System as an alternative

Table 2. Applied systems

Area	applied system
Daejeon	DSRC/DSRC
Inchun	DGPS
Gwangju	DGPS
Ulsan	GPS
Puchun	Small-wireless
Ansan	DGPS
Goachun	DGPS

Table Source : Reform-driven Report(2005, Gwangju)

3.2.1 BMS(Bus Management System)

The position measuring system and equipped with a radio transmitter and receiver station location and the current state and the headway time stamp is displayed in real time.

Duration destination, route information to the calling and automatically receive various information, such as can be achieved by a comprehensive exchange screen with respect to the bus.

Bus driver through the front of the device are attached to the vehicle, and arrival time or distance intervals, you can check the status of just the next stop on the bus scene.

In the case of unexpected accidents in the safe operation through the warning to be carried out in advance, and also that the headquarters of the well-known site locations and can be delivered immediately.

Bus companies can monitor the real-time bus location in their control, such as anger through the screen at the headquarters.

Through this, it is possible to efficiently proceed with dispatch.

Information in the atmosphere, such as customer status and stop the operation of bus routes also can be confirmed by real-time. At the same time traffic, such as the receipt of administrative action, through statistical analysis of the overall bus service can continue to improve the quality of customer service and safe operation.

3.2.2 BIS(: Bus Information System)

The bus driver of the vehicle or distance intervals are through the device inside the vehicle, it can be confirmed immediately and will take time to the next stop.

Unexpected accident agility to respond directly can also be planned in advance.

This is a general traffic information by combining the electronic system for the information, communication, vehicle technology for improving communication traffic problems and provide the best service to the customer.

National roads, including the driver targeting traffic information, road conditions, weather information, refer to the information collected, such as driving a systematic, organized, and can be classified by their subjects to perform the functions provided in a timely manner.

3.2.3 ITS(: Information transformation System)

A comprehensive overview of oil, road leverages wireless communications tool around, the car terminal, transportation broadcast, achieve a seamless communication system that supports traffic to the bus driver to cell phones.

This system is a component of ATPS, ATIS, APTS, CVO, AVHS others.

3.2.4 Causal relationship between U-transportation services

The quality of publicness U-transportation services factor, usability, and represents a path through the economic analysis of the impact on

user satisfaction[10].

Table 3. Result of path analysis for U-traffic service quality

Independent variable	Publicity	Usefulness	Economic	User satisfaction
1. Service quality	.170*	.408***	.307***	.553***
2. System quality	.303**	.182*	.197*	.230**

*p<.05 **p<.01 ***p<.001

3.2.5 A causal relationship between the parameters and the dependent variable

The public nature of the parameters U-transport services, availability, and affordability represents the path analysis of the impact on user satisfaction.

Table 4. Result of path analysis for

Parameter variable	User satisfaction
1. Publicity	.138*
2. Usefulness	.486***
3. Economic	.244***

*p<.05 **p<.01 ***p<.001

3.2.6 Path Model

Figure 2 is a schematic view showing Table 3, the results in Table 4, the path model.

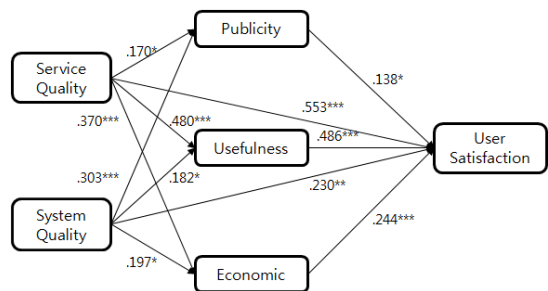


Fig. 2 A Model of path analysis for U-traffic service quality and user satisfaction

As shown in Figure 1, the U- transport services greatly affects the impact on the quality of service user satisfaction than systems quality. Parameters of publicity, availability, affordability, mediated the largest user satisfaction usefulness.

IV. Conclusion⁵⁾

As a customer using a bus of the local government for safe driving should be most important to the consumer as a hostage back burner as a routine occurrence of moral hazard is the dark shadow of the bus Quasi-public operation.

Despite the many advantages of the bus Quasi-public operation that the negative aspects of a form of collusion is not just a stakeholder but its benefits are presented as a prominent example, the nationwide spread of a number of bus Quasi-public operation is stable status.

Of course, only the monitoring of waste as a tax-premise device of the budget for the residents of ensuring safe operation of the quasi-civil servant status through the guarantee of bus drivers play an important role in safe driving a bus company workers and the most reasonable agreement when presented.

It is the taxpayers' money to support it tax of residents to be reduced to a system equipped with safety levels than expected, without safeguards for the lax management of bus companies do not preferable as they continue to raise public opinion turned against efficiency in the process of introducing Yeosu bus Quasi-public operation.

With the guarantee from residents of various accidents, disasters regard to subject safety and the use of buses is also to be considered safe operation of the bus driver at the same time.

Lack of awareness of safe driving passenger bus

driver is just as consumers is because of the accidents lead to residents.

Most buses will be completed discussions are done only it mainly for its efficiency in terms of committed budget issues of safety from disasters that are somewhat out of those discussions. It should be collected Quasi-public operation as the center of a vigorous debate over the future progress of research investigators.

감사의 글

본 논문은 2014년도 광주대학교 연구진흥지원 금지원사업의 지원으로 수행되었음.

감사의 글

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⁵⁾ This thesis partially modified on ICEIC 2015's presentation

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