

## **A Study on Review Processes of Community Bus Services Provided by Local Governments - A Case Study on the "Taco-bus" in Akashi City, Japan-**

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**Abstract:** It is an important duty for a local authority to provide reliable public transport within the local area for every citizen including elderly and disabled people. Many local authorities in Japan have introduced community bus services of typical community public transport services. However, the financial burden to the local authorities is huge, and sustainable public transport services that reflect the demand of the local areas are urgently sought. Attention is drawn especially to the community bus in regional public transport, and the PDCA cycle when it had paid attention to the review process at the introductory stage is presented in the present study. In addition, this PDCA cycle could be proposed and practiced to ensure that a smooth, advanced review could be achieved as a result in comparison with other introduction regions, and to be able to confirm the effectiveness of the community bus "Taco bus" plan in Akashi City, Japan.

*Key Words:* PDCA cycle, public transport services, planning theory, Community bus

### **1. Introduction**

Japan is aging rapidly, and is soon to become an ultra-aging society. One in five of the citizens are elderly, and it is estimated that the number will increase to one in four by 2015. This ultra-aging of society has already become apparent in some rural communities where it is not uncommon to find one in three of the population comprised of the elderly. This phenomenon is also observed in the new towns and suburbs that were developed around the big cities during the period of high economic growth. Ultra-aging is spreading in urban areas too. With this reality as the background, 'community bus' services, or public transport for mobility restricted users consisting mainly of elderly people, have been set up in many local authorities. Though there is no clear definition of what a 'community bus service' is, it is generally understood as 'the bus services operated directly by a local authority for the purpose of vitalizing the communities and promoting the welfare of the local residents, to eliminate black spots in the public transport, and to encourage the elderly to get about and make good use of public facilities'.

The disappearance of many commercial bus routes after deregulation of bus businesses in 2002, as well as reduction in running costs of the bus business, led to introduction of the community bus services by local authorities, which then spread rapidly to many areas in Japan. In April 2005, 914 local authorities (cities, towns and villages) operated such a service, representing 38% of the total of 2,418 local authorities. The review of the Road Transport Law in October 2006 made operation of the community bus services to meet the diverse needs of

the local communities even easier by introducing the notification system for the bus fare through an agreement with the local transport commissions. The introduction of the Law on Vitalization and Regeneration of Local Public Transport in October 2007 will certainly strengthen the case for introduction of the community bus services.

When evaluating a community bus service, it is important to take into consideration measures such as improvement in local transport service level in general or opportunities for outings for elderly people, rather than just assessing usage and profitability. In reality, only 6 out of 632 community bus routes in the Kinki region are profitable. One in ten routes receives a quarter of its operation costs from the authority, while six out of ten routes receive three quarters of the operation costs, demonstrating the big financial burden on local authorities and the need to improve the efficiency of the operation.

It should therefore be the primary concern, when reviewing the possibility of continuation of a community bus service, that the profitability of the service be monitored within the scope of the planning, and if the service does not meet requirements but there is still a need for providing transport services for the elderly, the operational model should instead be replaced by others such as using taxis.

In order to improve efficiency, it is important to obtain an accurate picture of the transport needs of the community and offer the service to meet these needs at minimal cost without compromising safety. It is also important to conduct post implementation monitoring on whether the service is gaining users according to the initial plan and, if not, to try to find out why.

By demonstrating the structural problem, Tokunaga et al (2006) pointed out the risk of implementing a community bus service as it could consume public funds indefinitely if usage remained low.

As for the planning process of community bus services, Nakamura (2006) pointed out the importance of evaluation and monitoring during service operation, supporting the point with a planning and implementation schedule from the basic planning stage to the operation model creation stage. He also laid out a procedure, with the points to note, regarding when the future of a service should be discussed on the issues of passenger count and profitability.

In addition, Takeuchi et al (2008) analyzed the problematic structures of community bus services based on case studies, demonstrating the characteristic analysis and thinking behind evaluation of community bus services operations.

Including the abovementioned examples, previous studies of the planning process of community bus service indicate the importance of the planning process as well as the post-implementation review process of the service, showing examples of appropriate operation reviewing procedures.

In order to conduct a reviewing exercise smoothly, it is crucial to obtain the understanding and the consensus of the local residents. If this process is left pending till the actual time of review, the administrative decision might not be reached, especially the decision regarding discontinuation of routes. It is therefore important, right from the planning stage, to formulate a process in which the residents are informed about the possibility of future review and subsequent decision on discontinuation of certain routes.

PDCA (Plan-Do-Check-Act) is one of the management cycles. It is a management method for promoting maintenance of quality, an improvement, and a continuous business improvement activity by the cyclic process. It is an improvement process evolution method used also for

ISO9000 series and ISO14000 series. The PDCA process cycles repeatedly and can improve a sustainable business.

- Plan : The business plan is made based on the forecast in results in the past and the future.
- Do : The business is done according to the plan.
- Check : It is verified along the plan of execution of the business.
- Act : The part where the business plan is examined and improved.

The PDCA cycle has been practiced in a road traffic plan of Japan up to now. For instance, the Ministry of Land, Infrastructure and Transport Road Bureau introduces the technique of road administrative management that evaluates the achievement level of the road business, and is practicing the PDCA cycle. However, actual examples of having introduced the PDCA cycle are few, though the necessity of the PDCA cycle is recited to the measure of a regional level such as the community buses. In addition, it is built in, and the practical example is not seen in the process at the PDCA cycle at the early stage of the plan.

The present study examines the plan process by the PDCA cycle when the process had been built in that took a hard look at a plan according to the review standard set beforehand after being introduced in the Akeshi City Taco bus service. It is the one where the concrete process was proposed and practiced, and the result was considered to realization in the community bus "Taco bus" plan in Akashi City, Japan.

## 2. Analysis of community bus service operation reviews

In order to investigate the review criteria and the approach method of post-implementation service operation reviews, a questionnaire was sent in October 2006 to seventy-five local authorities that operated community bus services, and forty-three responses were obtained. Among them, 81% conducted post implementation service operation reviews. However it was shown that these reviews were not conducted as part of the initial plan but the decision was taken after the operation had started. Also 15% (6 out of 39 routes) were being reviewed under consideration of discontinuation (Fig.1), indicating the necessity of such an exercise.

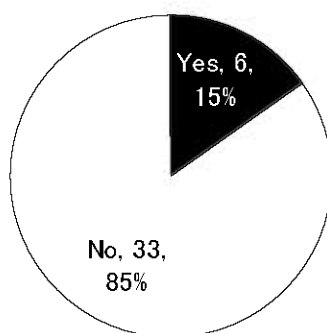


Figure 1. Route discontinuation (including planned)

One outcome of the reviews is discontinuation of the route, and some local authorities have quantitative criteria for taking that decision, such as 'if the income from the route service was lower than 40% of the operating cost' in the C-bus service in S. city, or 'if the average passenger density was lower than 2.0 persons' in Y-bus in M. city. However, these criteria are not publicized to the local residents, and were not included in the review process from the very beginning.

In order that local residents understand the budget of operating the community bus service and participate in the decision on rectifying uneconomical and inefficient routes, it is very important to inform the review criteria prior to introducing the actual service and to obtain understanding and consensus regarding the future of the service including possible discontinuation of some services.

### 3. Issues facing the Taco bus service in Akashi city

#### (1) Overview of the Taco bus service

Akashi city in Hyogo prefecture started considering implementation of the community bus service in FY 2002. After the pilot project in Uozumi and Okubo-minami districts from November 2004 to March 2006, the Taco bus started its full operation from April 2006 (Table 1 and Fig.2).

Table 1. Summary of Taco bus service

Objectives	Reduction of black spots in public transport, securing transport means for mobility restricted citizens
Operating routes	3 routes at present: Uozumi in western Akashi, Okubo and Shimizu-minami districts
Operation details	Hours : Approx. 07-20 Frequency: Every 30 minutes to one hour Distance between stops: Approx. 300 m
Fares	100 yen or 200 yen according to distance traveled



Figure 2. Taco bus, Akashi city

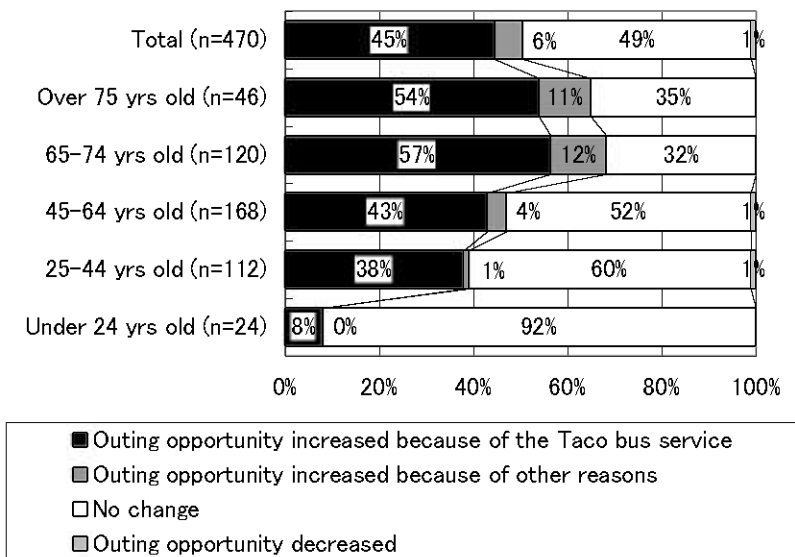
#### (2) Evaluation and issues

With the introduction of the Taco bus service with three routes, the total area of the black spots (more than 600-1000m from the nearest railway station or more than 300m from the nearest commercial bus stop, except in the designated redevelopment sites) in public transport was reduced by 6%, from 10,551,000 m<sup>2</sup> to 9,914,000 m<sup>2</sup>.

A user questionnaire was administered in January 2005 and obtained 512 responses. As shown in Fig. 3, the service encourages outings, especially with the elderly. The service also affected the everyday lives of a large number of people, with ‘The service gave me assurance that I can go out at any time’ and ‘The service made shopping easier’ scoring high (Fig.4).

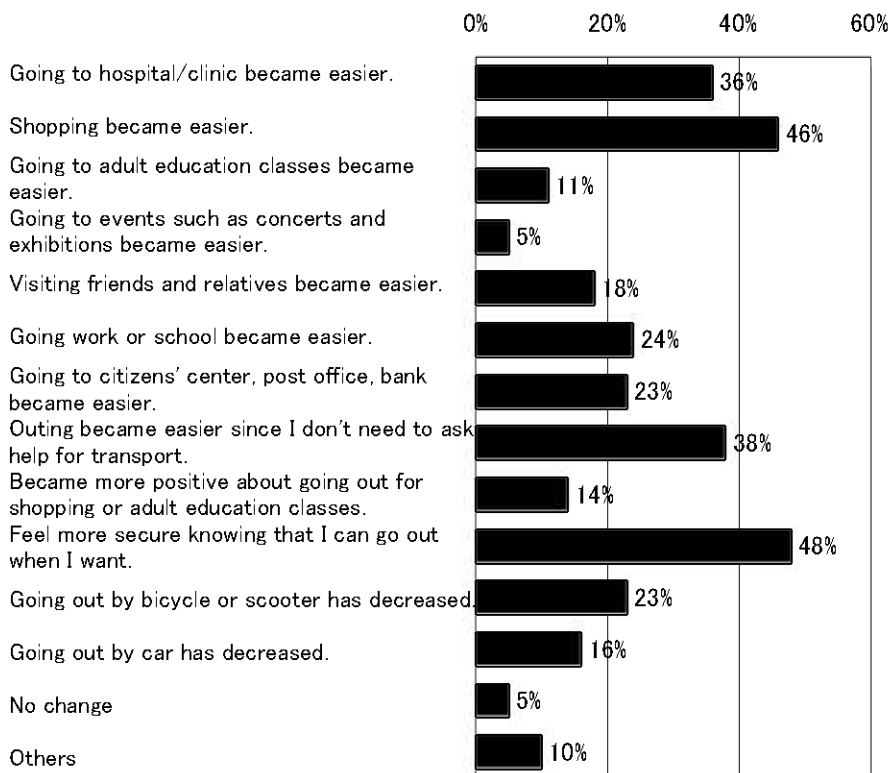
The result of the questionnaire confirmed that the implementation of the bus service not only

reduced black spots in public transport—which was the main aim of introducing the Taco bus service—but also contributed to ensuring means of transport for mobility restricted citizens.



\* Bus users' questionnaire

Figure 3. Change in opportunity for outings after implementation of the bus service



\*Multiple answers (n=501)

Figure 4. Lifestyle changes after implementation of Taco bus service

It was therefore not surprising that 98% of the users wanted the service to continue. Not only with the actual users, but a questionnaire for all residents including those who did not directly benefit from the service, administered in July 2005 with 1,553 responses, revealed that 67% approved of continuation of the service while only 4% opposed it.

Highly supported by the citizens of Akashi, with increasing user counts (Fig.5) and a good profitability balance, there is a large demand from those residents who have not yet been covered. The consideration now is to expand coverage to eliminate all black spots in public transport.

The expansion, however, causes some worry, since it may lead to unchecked public spending. The expansion program, with 17 planned routes, will inevitably increase the financial burden on the city authority, and therefore a process with an inbuilt break was necessary.

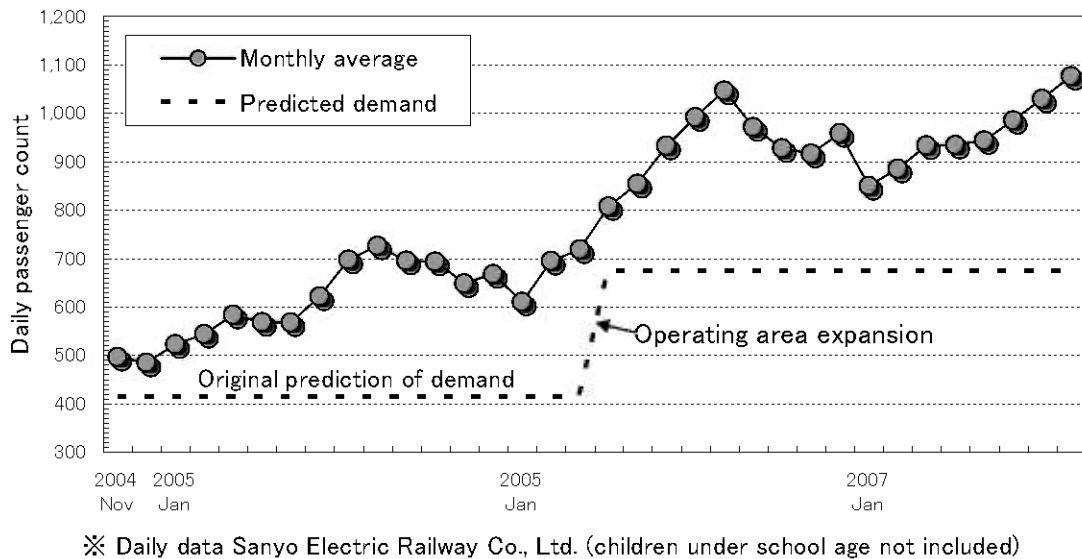


Figure 5. Shift in Taco bus user counts

#### 4. Implementing a PDCA cycle into the planning process

In planning community bus services, it is difficult to predict accurately the elements that affect transport needs, due to reasons such as the diverse characteristics of each area. There are many cases where pre-operational predictions were quite inaccurate. In this kind of hard-to-predict transport system, the PDCA cycle, with its repetition of checks and actions, can be effective; in effect it reviews operational realities after starting the service. The PDCA cycle was proposed for the community bus service, and is shown in Fig.6.

Many community bus services start with trial runs that can be positioned as the first round in a PDCA cycle. But there seem to be no cases where this exercise has been continued after the trial runs. Since community bus services are operated by local authorities, it is difficult to secure specialists in the same position for long, and also, strong voices from certain residents may influence decisions. Because of these factors, even if the service does not meet local needs or reach predicted user levels, quite often it takes a long time to discontinue an uneconomical service or the issue may not be tackled at all. This is why it is important to embed the review process in the plan right from the outset.

In the planning process in the past, PDCA was normally assumed to cover only one cycle, and the evaluation process of the review was not specified at the early planning stages. Consequently, there are many instances of situations in which it could not continue to be enforced even after being introduced. This held even when the local populace became aware of the idea of vested interests influencing the operated route, and even when review followed

by discontinuation of the service based on the evaluation was considered necessary.

The authors of this study planned to embed the review process with the decision criteria at the next 'plan' stage.

The operation review standard reviewed this based on the prior numerical value set when the following represented evaluation figure was set according to the introduction purpose of the community bus, the planner selected beforehand, and it planned, was based, provided, and assumed to be a reviewed process.

< typical evaluation figure >

- The provincial part (discontinuation substitution for traffic blank ground etc.): Ratio etc. of person from whom outgoing frequency such as senior citizens increases person's ratio that feels inconvenience in the senior citizen's number of users and movement.
- City part (public, traffic network enhancement and urban activation): Revenue and expenditure rate, average boarding density, local populace's availability, and satisfaction rating etc. of service.

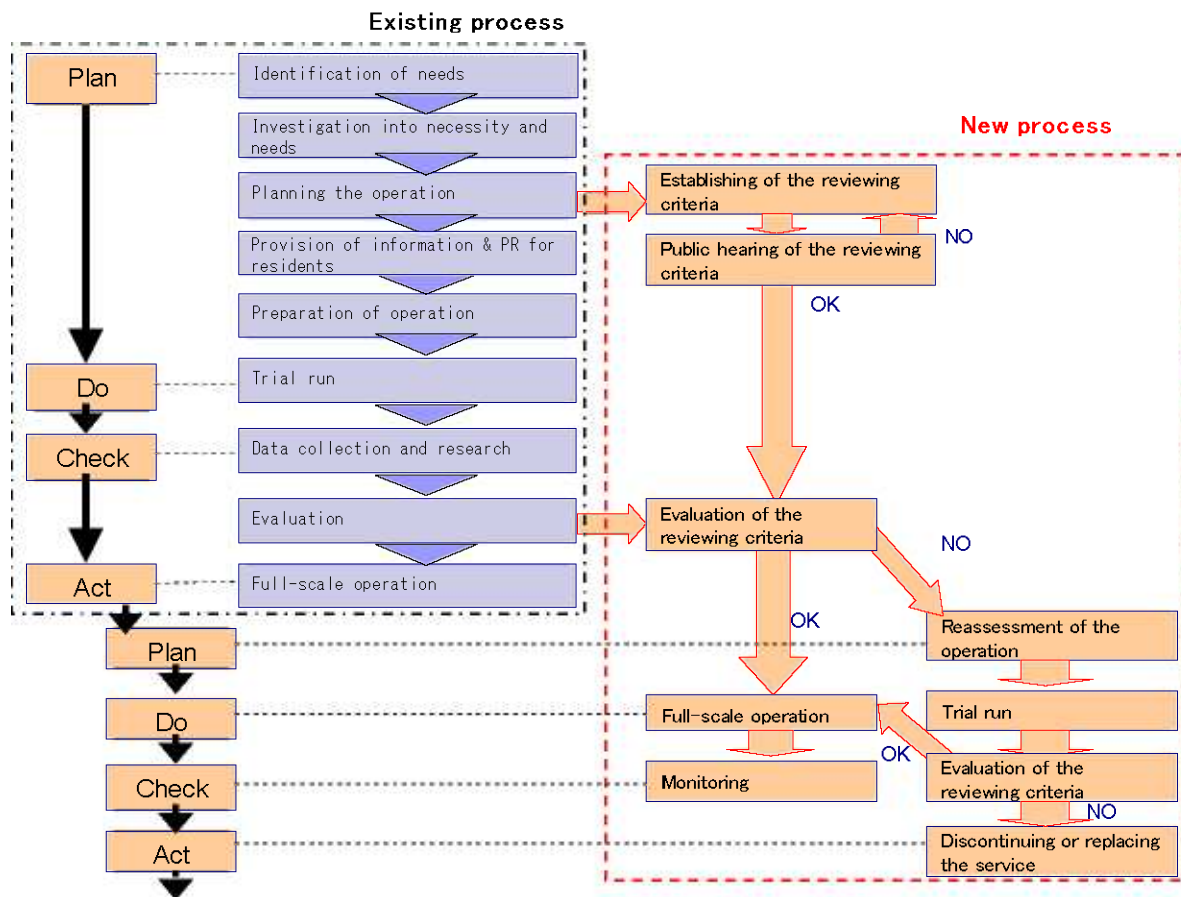


Figure 6. Proposed PDCA cycle for implementation of community bus service

### 5. Route review process in the Taco bus project

While implementing the community bus service, Akashi city recognized the importance of a sustainable service based on the predetermined financial outlay with clearly defined objectives, accountability and process. In cooperation with the authors, the city authority investigated the method for introducing a clear review process for its future community bus

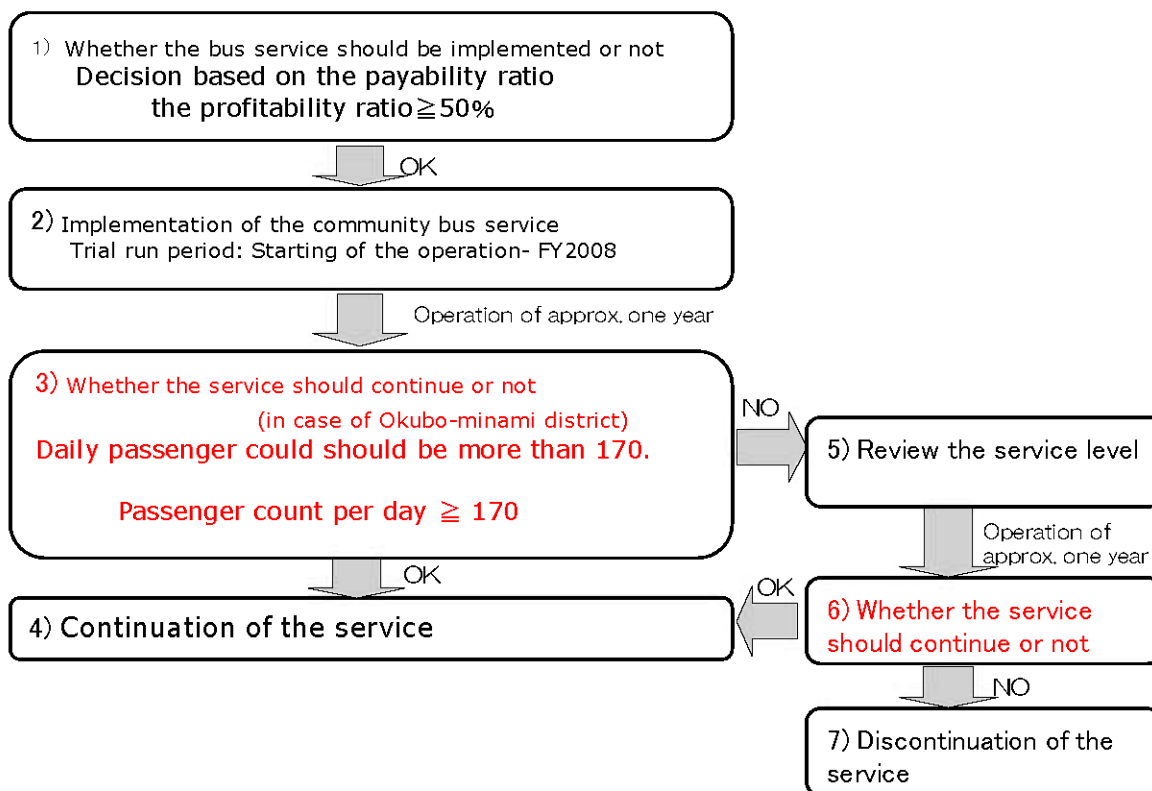
service.

We have devised a process by which the community bus reviewing committee would be set up when the profitability ratio becomes lower than 50%. The committee will then decide the future of the route, concerning discontinuing it or replacing it with community taxis.

The 50% profitability ratio was set using the average ratio of 48% found in the abovementioned nationwide survey of the community bus services in urban areas of more than 100,000 people as well as the profitability ratios of the trial run in Akashi city.

We considered differentiating the profitability ratios according to each area/ district, but decided against this and opted for the same rate throughout, for the following reasons:

1. All the areas/districts covered by the service implementation have similar population density, road profiles and other operational characteristics,
2. Estimated profitability ratios of all the areas/districts fall within  $\pm 10\%$  of the average ratios of all the areas/districts combined, and
3. To make it easy to explain to the residents.



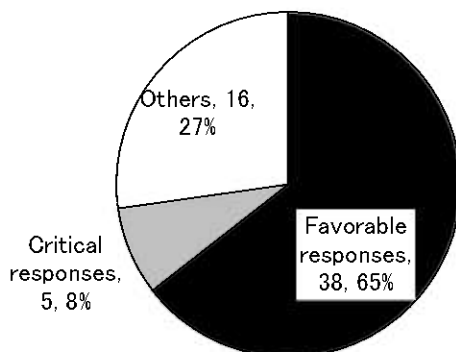
\*The final decision to be made at the reviewing committee

Figure 7. Decision criteria at the residents’ meetings, for continuation of the bus service

We also converted the ratios into an easy-to-understand format such as passenger numbers per day. Disseminating such information was an important part of this process, and town meetings to exchange opinions with residents were held at nine different venues in Akashi city. An example of this process is shown in Fig.7. In Okubo district, for ease of explaining, the cut-off criteria of the passenger number was presented as a minimum of 170 a day, which was calculated with the profitability ratio of 50% as well as planned fare and operational costs. The review process also includes the decision of discontinuing and changing routes as well as changing fares.



At town meetings where the heads of local associations such as the residents’ association, the women’s association and the senior citizens’ association presented the process foreseeing the possibility of future discontinuation, it drew high interest and low criticism (Fig.8). At these meetings the desire of the residents for continuation of the service strengthened, and we received many positive suggestions on how to make the service more user friendly or how every resident could be involved in voluntary PR activities to increase passenger numbers, confirming the viability of embedding these exercises into the process.



\* Opinion arrangement result in meetings in nine districts (opinion,%)

Figure 8. Responses regarding the discontinuation process at a residents’ meeting

### 6. Outcome of the reviewing exercise

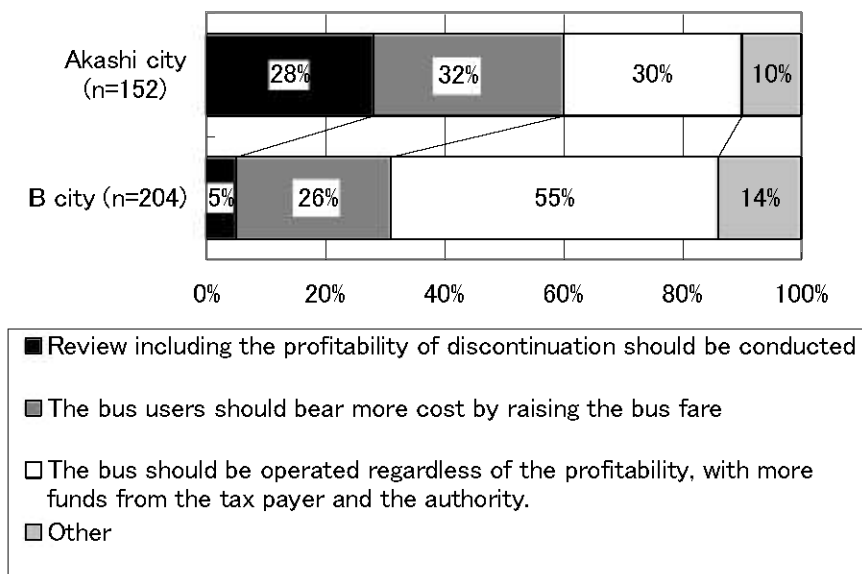
The Akashi city authority implemented the full scale community bus service ‘Taco’ bus on 17 routes covering the whole city area from November 2007, but in June 2008, 13 out of 17 routes were underperforming, needing an appropriate and urgent review for these routes.

Table 2. Summary of city

	Akashi city		B city	
Area	49.24km <sup>2</sup>		36.11km <sup>2</sup>	
Population	Total: 293,209 65 years old and over: 59,303 (Rate of aging: 20.2%)		Total: 347,896 65 years old and over: 66,132 (Rate of aging: 19.0%)	
Travel behavior (All purposes)	Representative transportation	All purposes	Representative transportation	All purposes
	Train	10.5%	Train	15.9%
	Bus	8.1%	Bus	2.7%
	Car	19.1%	Car	32.8%
	Motorcycle	21.6%	Motorcycle	19.5%
	Walk	40.2%	Walk	28.8%
	Others	0.6%	Others	0.3%
	Total	100.0%	Total	100.0%
Community bus introduction time	November 9, 2004		December 1, 2006	

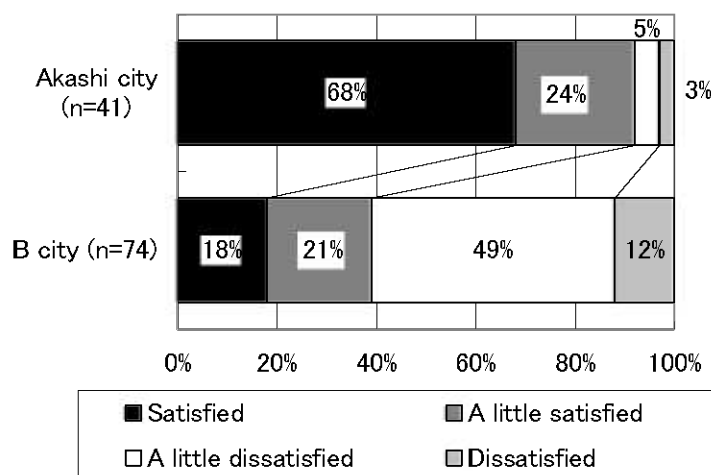
The review process, which had been laid out at the beginning of implementation of the bus service, was therefore triggered. In order to verify its effectiveness, the authors compared it with another similar bus service, running in City ‘B’, to which the authors had contributed in implementation, using the results from the questionnaires and workshops. City ‘B’ is similar to Akashi city, being a mid sized satellite town just outside a much bigger city and with the same level of public transport structure and population density. Table 2 is a comparison of the

urban forms of Akashi City and ‘B’ City. The user numbers per bus as well as the time period from introduction of the bus service to its review are almost the same. However, one significant difference is the review process; the abovementioned review process was not established in City ‘B’.



\* Bus users' questionnaire

Figure 9. Favorable responses on reviewing in the user questionnaire



\* Workshop participant questionnaire

Figure 10. Satisfaction rates for workshops

A questionnaire survey of bus users in Akashi city revealed that a large number approved of the review that included the possibility of some routes being discontinued (Fig.9). The acceptance of the review, from the residents' point of view, is higher in Akashi city compared to City ‘B’.


The review processes involving bus users and local residents were conducted in both cities. As shown in the typical feedback comments of the residents in Table 3, the review process in Akashi city was of a high level in content and proceeded smoothly, since the idea of the review and its criteria had already been explained to the residents prior to the implementation

of the bus service.

In contrast, the feedback comments in City 'B', also shown in Table 3, were more negative against the review, indicating mistrust and disbelief toward the authority, though they also had held residents' meetings prior to the service implementation but without clear indication of the review criteria.

As shown in Fig.10, from the questionnaires, the satisfaction ratings at the workshops also scored higher in Akashi city, demonstrating the utility of this review process.

Table 3. Typical opinions at the reviewing workshop

<p>【At the workshop in Akashi city】</p> <ul style="list-style-type: none"><li>• We knew that if there were not many users, the bus service would be discontinued, and that is why so many people are gathered here today. The more people that gather, the more opinion and more information will be generated with which to work for the future.</li><li>• This new way of doing things was good because the residents were given a chance to think about the reviewing.</li><li>• It was good to come because I could hear about problems that I wasn't aware of. I hope you discuss this issue from many different angles so that the service will continue.</li><li>• I'm happy to be able to attend this meaningful meeting where I could express my thoughts on the routes of Taco bus. Though I understand there are many problems in running the service, I hope the service will continue and I will help to form the next plan.</li></ul>	
<p>【At the workshop in B city】</p> <ul style="list-style-type: none"><li>• It's difficult to change the operation once it has been started. How would you deal with residents who are currently using the service?</li><li>• I want the bus to be run from the residents' point of view, not through decisions made by the authorities. If a review had been planned, we should have been given the information about it, so we could have prepared some alternative ideas.</li></ul>	

## 7. Summing up

In this study, the review criteria in implementing the PDCA cycle, and the approach and method of its implementation in a community bus operation were investigated using the Taco bus project in Akashi city. The outcome of the investigation was then applied to the actual review process of the Taco bus project, which was then compared to its counterpart in another city. From this exercise the following findings were made:

The plan to assume only one cycle of PDCA was basic. This had led to various problems, as regarding discontinuation of routes after actual review, because until then the review process had not been specified at the early stages of planning. In the present study, review of the community bus service was able to generate the process that could be predetermined and implemented smoothly by building in the review process, including the operation review standard, beforehand at the planning stage.

As demonstrated at the meetings with the local residents, the review process using the PDCA

cycle, which includes the possibility of discontinuation of underperforming routes, was well received by the residents, thus confirming the feasibility of the PDCA cycle implementation proposed in the study.

Since the idea of the review and its criteria had already been explained to the residents prior to implementation of the bus service, the town meetings and workshops conducted as part of the review process were of high level in content and proceeded smoothly compared to the situation in the other city, confirming the effectiveness of implementation of the PDCA cycle proposed in the study.

Similar public transport systems including community bus services are being planned, and will soon be in operation in other cities. The development of a planning process based on this study will be expected to contribute to establishment of sustainable local public transport systems that are valued by the local community.

In closing, we would like to express our sincere gratitude for the cooperation of the Civil Engineering and Transport Policy Office, Akashi city Authority, Hyogo Prefecture.

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