

TDM Experiment of Railway and a Shopping Centre using Smart Card System

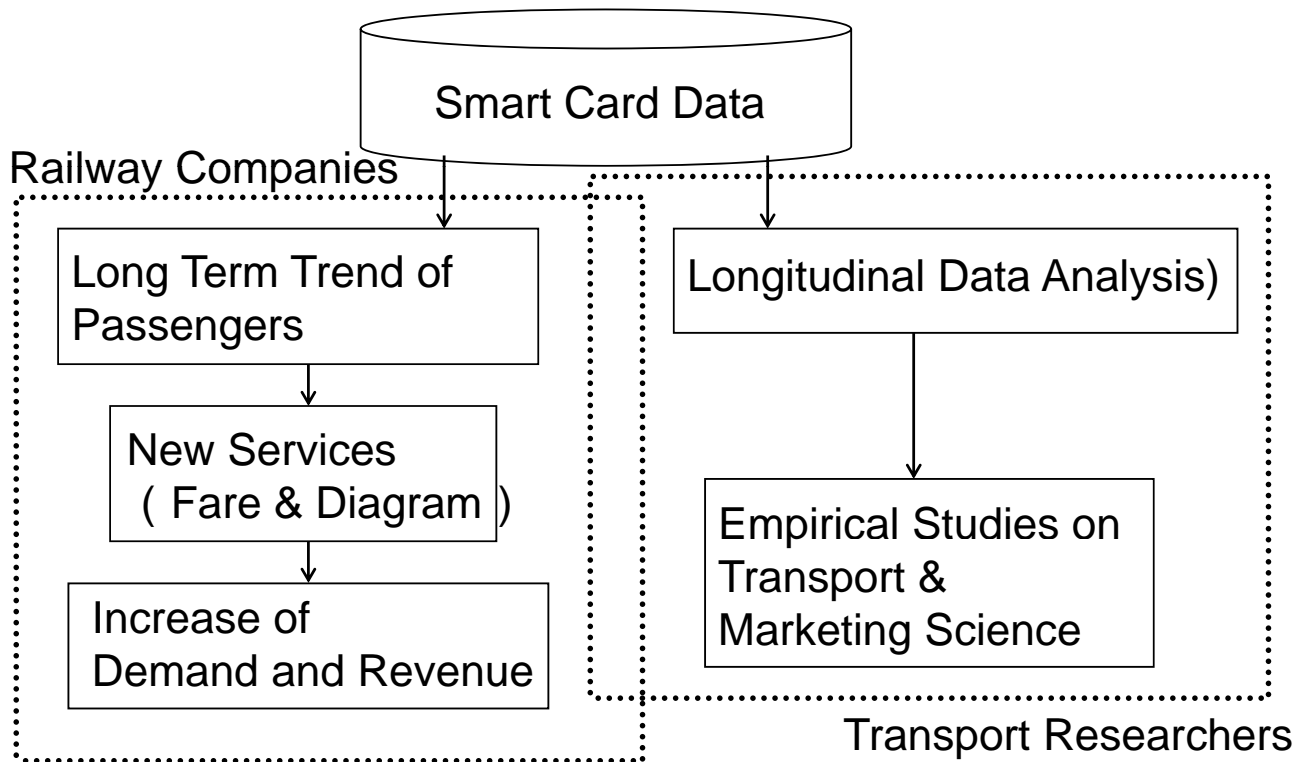
*Yasuo Asakura, Takamasa Iryo, Yoshiki Nakajima, Kaoruko Sugita, Sei-ichi Kitano,
Kobe University
JAPAN*

Railway Smart Card Systems in Japan

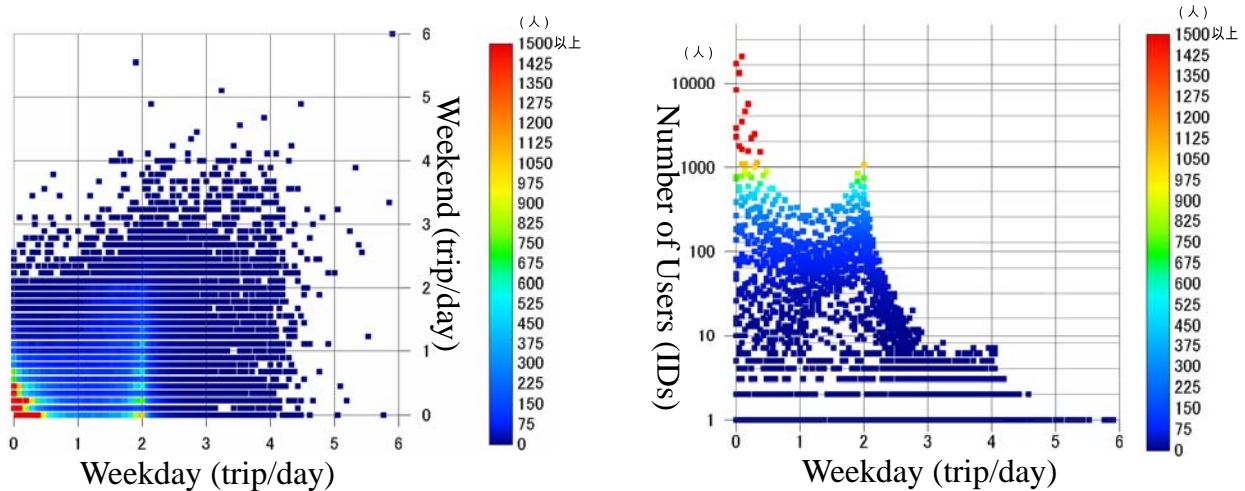
- ICOCA of JR (Japan Railway) WEST
- SUICA of JR EAST
- PiTaPa (Postpay IC for Touch and Pay) system of Private Railway Consortium in Kansai Area



Possibility of Smart Card Data (1)

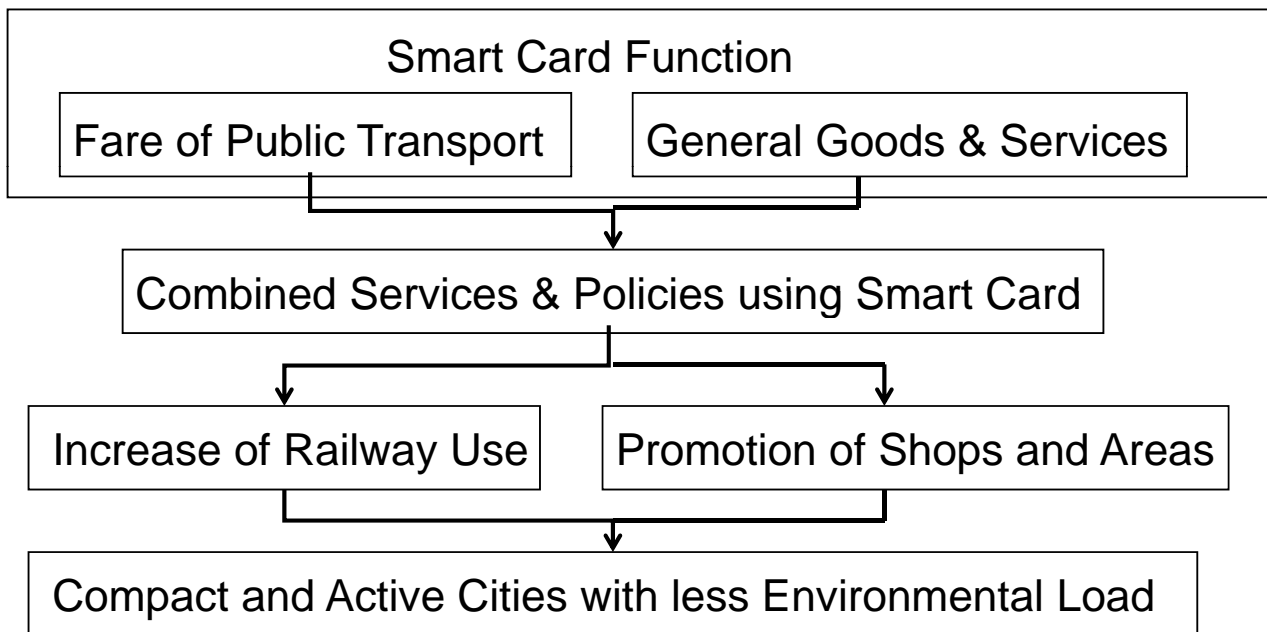


Frequency of Smart Card Use



Period : June 2007 ,
Index : Averaged Frequency of Smart Card Use in a Day (trip/day)
Number of Samples : 198,240

Possibility of Smart Card Data (2)



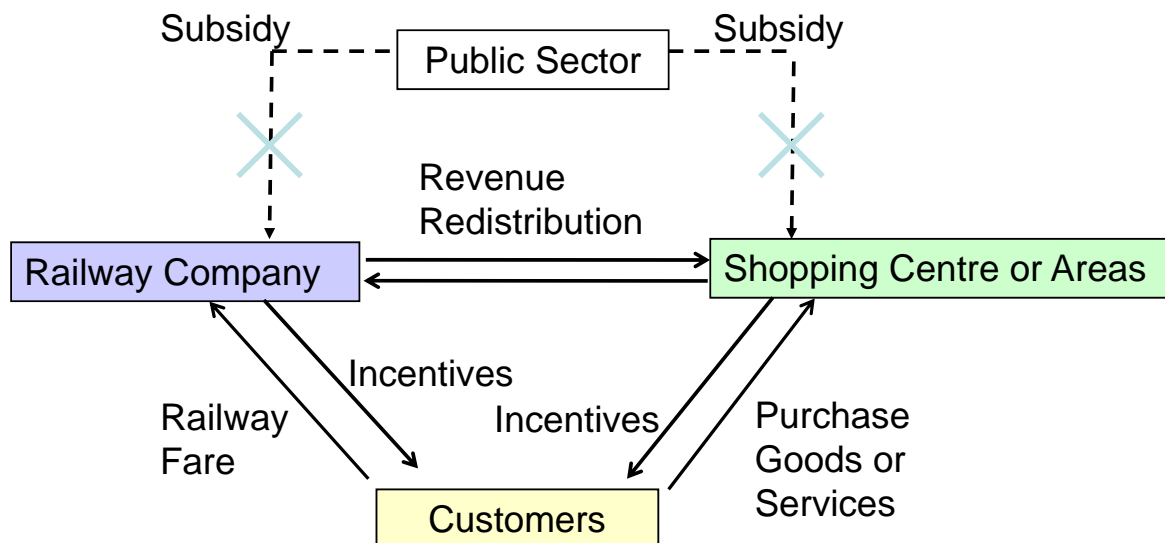
Background

- A downtown shopping centre usually provides free car parks for customers who come by automobiles.
- But rarely makes reimbursements for those who use public transport. This is because the verification of boarding on public transport is not easy without any complex procedures.
- A smart card system makes possible to verify the customer's boarding on public transport.
- This could be incorporated into the TDM (Travel Demand Management) scheme of public transport collaborating with shopping activities as one body.

Objectives

- This study aims to propose a collaborative TDM scheme in which a shopping centre provides incentives for customers who intend to use railways.
- A field experiment was carried out in collaboration with a railway company and a shopping centre.
- This study also aims to show the travel behaviour of customers who joined the experiment.
- In addition to the questionnaire survey, the railway smart card data of customers are analyzed to know their longitudinal railway use.

Collaborative TDM Scheme

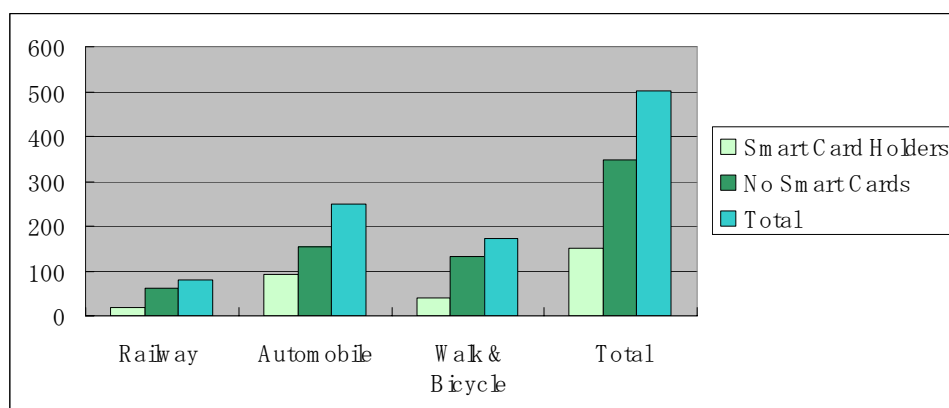


Field Experiment

- Field experiment was held at a shopping centre located 5 minutes walk from a railway station.
- The floor space is more than 34,000 m².
- The averaged number of customers is about 22,000 persons per day.
- Capacity of car park is about 3,000 vehicles.
- You will have a 2 hours free car park ticket when you buy more than 2,000 yen.

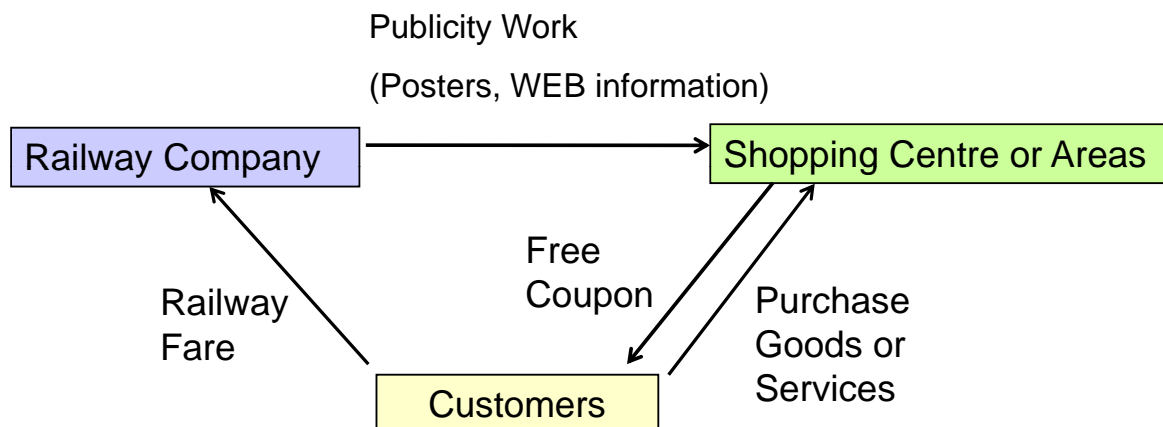


Preliminary Survey (# of samples 500)



- Shares of railway and automobile were 16% and 49%.
- Smart card holders were 30% of all customers.
- Targeted customers were the smart card holders who actually came by railway. This was just 4%.
- 37% of automobile users has a smart card.
- There are a large number of potential customers who could come by railway.

Design of TDM Experiment

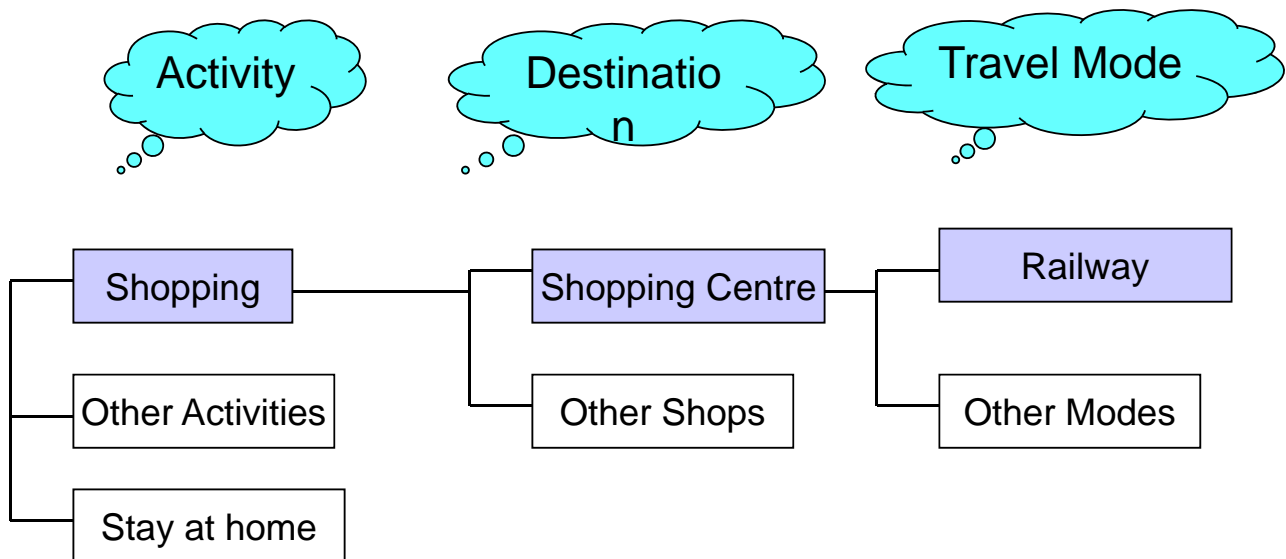


- A 500 yen free coupon was given to the customer who spent more than 2,000 yen.
- The incentive was provided by the shopping centre.
- The railway company supported the publicity work.

Smart Card Information

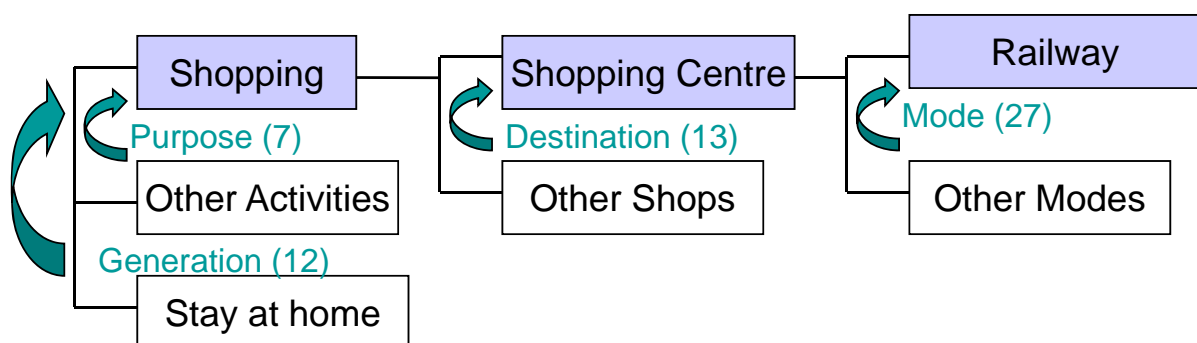
- A customer was required to show his/her ID information of the smart card for validating the railway use.
- The record information involves the date and time of railway use, the names of the on and off board stations.
- The behavioural data were also collected with questionnaire survey.
- The allowance of analyzing the historical personal record of railway usage was also confirmed. All these data were aggregated and anonymously analyzed.

Assumption on Behavioural Change



Participants were asked the alternative activities, destinations and travel modes if the field experiment was not held.

Actual Behavioural Change

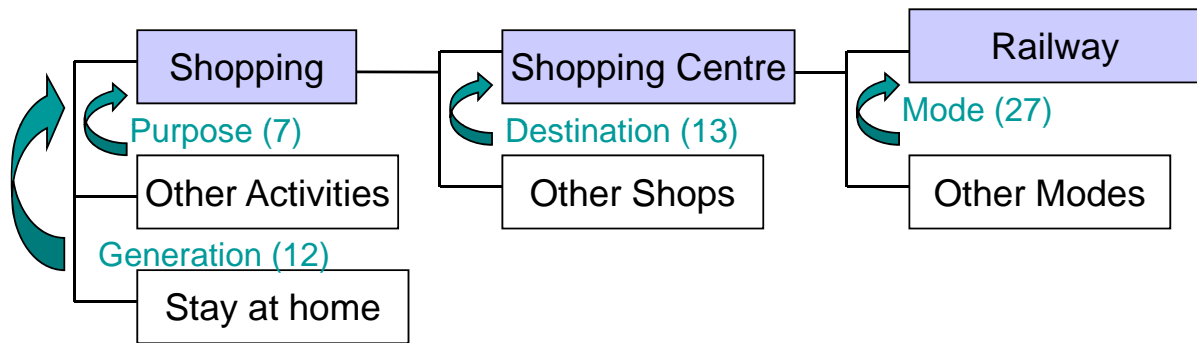


Alternative Behaviour

Visit here as usual	127	66 %	No behavioural change
Visit here, but other travel mode	27	14 %	Travel mode change
Visit other shopping centre	13	7 %	Destination change
Visit other places, but not for shopping	7	4 %	Activity change (trip purpose change)
Stay at home	12	6 %	Activity change (new trip generation)
Others or unknown	4	2 %	--

190 100%

New Customers and Railway Users



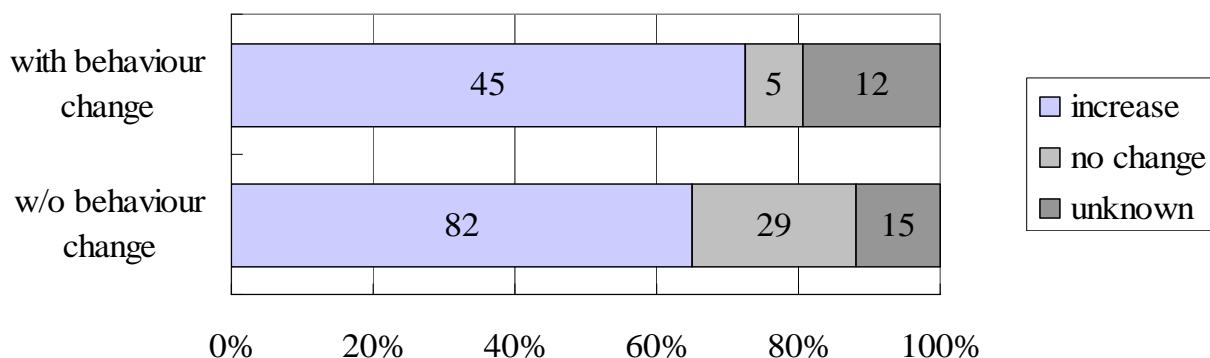
New customers to the shopping centre
 = Generation (12) + Purpose (7) + Destination (13) = 32

32/190=17%

New railway users
 = Generation (12) + Mode (27) = 39

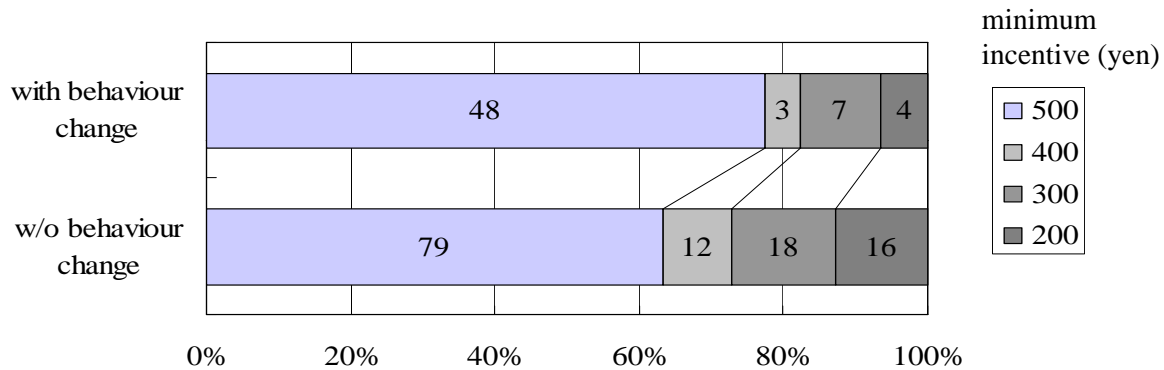
39/190=20%

Expected Frequency of Shopping Trips in the Future



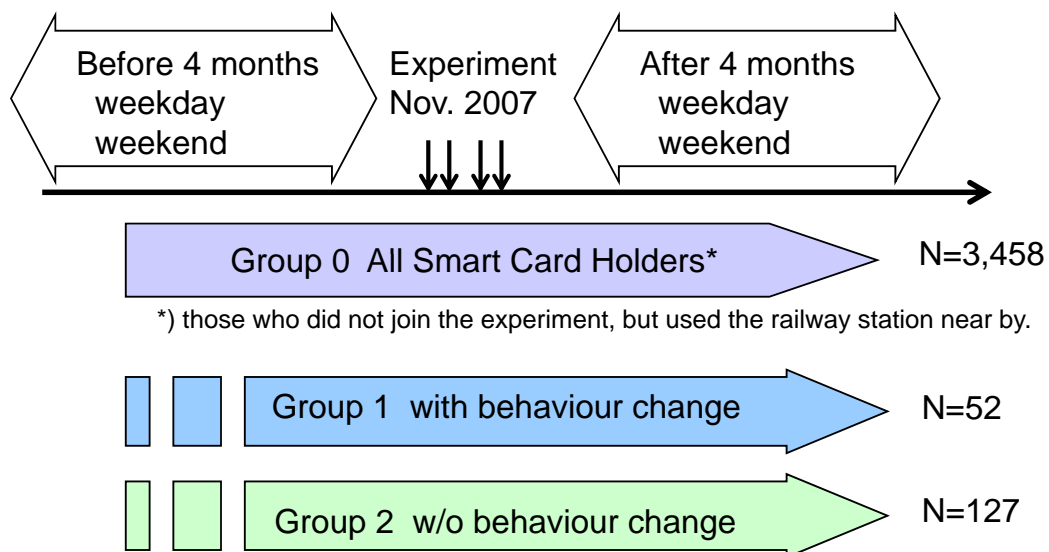
- More than 60% answered that the frequency would increase.
- The percentage of 'increase' for the group who changed their behaviour was greater than that of the group without behavioural change.
- Once a participant has actually changed his/her behaviour, he/she will make a positive answer for the future expectation.

Expected Minimum Amount of Incentive for the Future Experiment



- Those who did not change their behaviour would join the experiment only if positive incentive was provided. However, 60% of them expected the same incentives. Those who actually changed their behaviour might have paid some monetary costs.
- They answered more seriously on the amount of incentives.
- Large monetary costs may be required when the same experiment is continuously held in the future.

Analysis of Smart Card Data



Frequency distribution of number of smart card usage (# of trips) per day.
 Any differences? any changes?

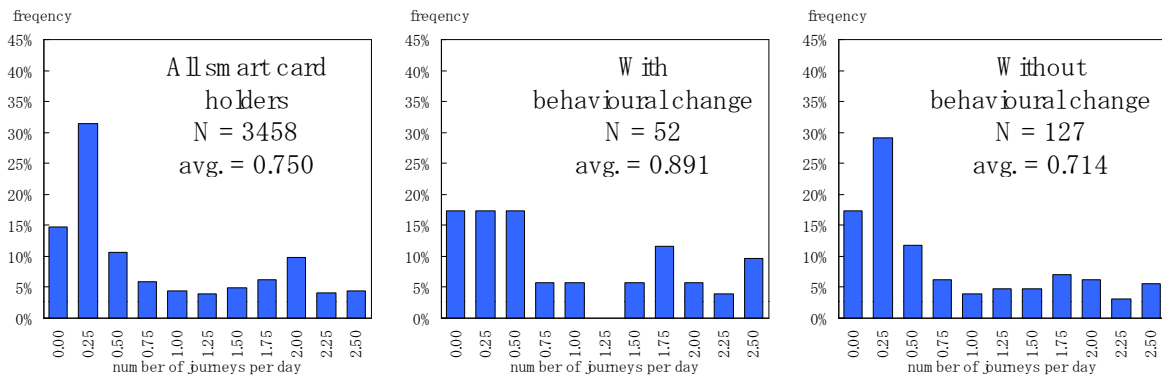


Figure 5.a Number of Trips per Day (Weekday, Before Experiment)

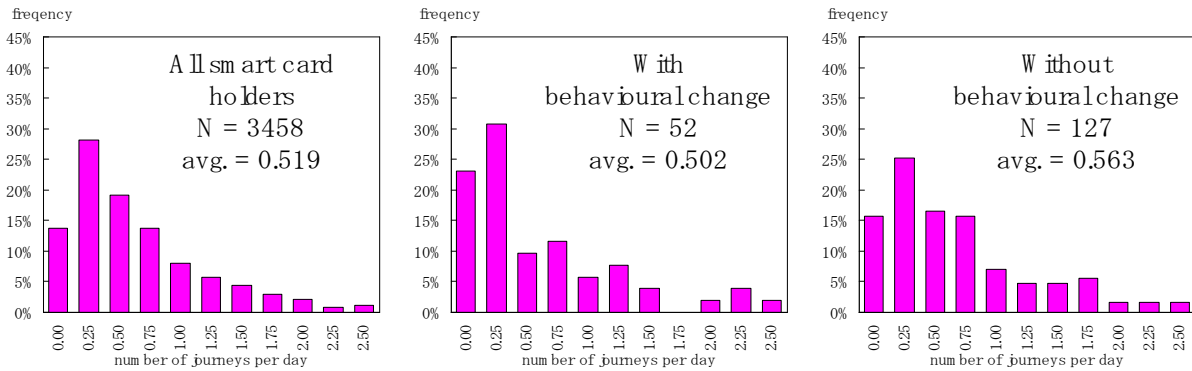


Figure 5.b Number of Trips per Day (Weekend, Before Experiment)

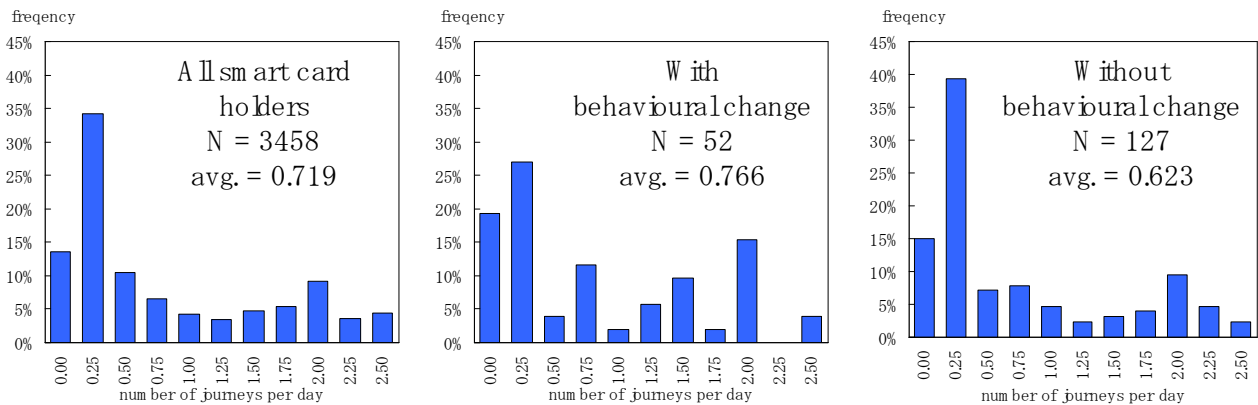


Figure 5.c Number of Trips per Day (Weekday, After Experiment)

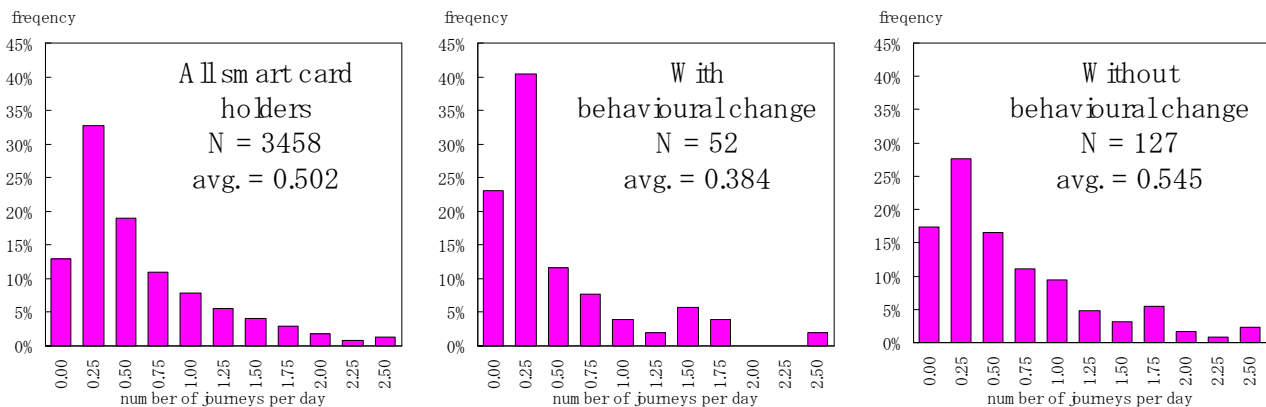
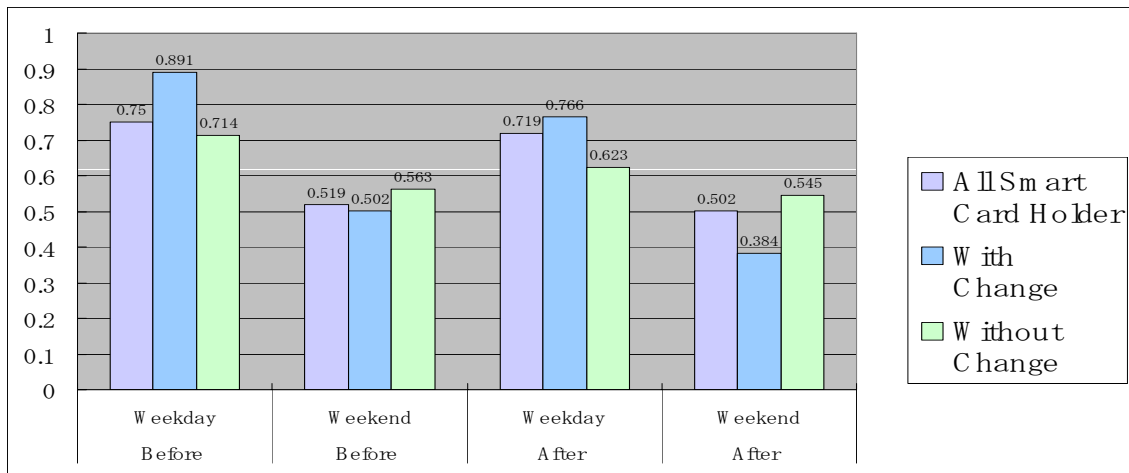


Figure 5.d Number of Trips per Day (Weekend, After Experiment)

Comparison of Average Values



- Number of trips became smaller due to seasonal effect.
- Those who changed behaviour were the less frequent users in weekend but frequent users in weekday.
- Those who *did not* change behaviour were the less frequent users in weekday but frequent users in weekend.

Implication

- Those who used the railway frequently in weekday might have higher chance to get the information of the experiment, and changed travel behaviour to participate the experiment.
- The publicity to heavy users of railway may be effective to encourage them to generate shopping/railway trips in weekend.
- However, such behaviour was unusual for them, and might not continue after the experiment unless attractive incentives were provided.
- Those who used railway frequently in weekend were not necessary to change their behaviour to participate the experiment.
- On the other hand, they showed the higher frequency of the smart card usage after the experiment, and this might be the effect of the experiment.



Summary

- The collaborative scheme of a railway and a shopping centre was proposed as a TDM policy of promoting shopping areas.
- A smart card system for public transport and shopping activities must be essential for this collaborative scheme.
- Towards sustainable systems, design strategies of incentives and rules are more important as they should be not only attractive for consumers but also affordable for suppliers.
- A large amount of smart card data could be useful for analyzing the longitudinal behaviour of customers and developing TDM policies in the future.