How Should Universities and Railways Cooperate in a New Era?

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1. Preface

The word "railway" is associated by some people with an old-fashioned image, compared to automobiles. But the railway actually serves as an important piece of social infrastructure. It has great significance not just as a means of transport but as a medium of information.

Students at Keio University Shonan Fujisawa Campus (SFC) are learning through a course of lectures funded by East Japan Railway Co. (JR East) issues such as how the railway will be positioned in a future information-oriented society, how it is going to solve the problems it currently faces, and what the future vision for railways should be. They are also conducting different experiments to figure out the ideal way for universities and the railway to cooperate in a new era. In this article, I would like to introduce some such activities.

2. Student use of railways

The railway in Japan, including the Japan Railway (JR) group and other private railway companies, provides people with both the means of commuting to work or school and the means of travelling for other purposes. Roughly speaking, railway revenue is split almost evenly between services for these two types of passengers. In either case, university and other students contribute greatly to railway revenues. People in this age group represent a significant proportion of railway users.

As a means of commuting, the railway plays a vital role in urban areas, where schools are concentrated. Even on regional trains, high school students sometimes constitute the majority of passengers in some time bands. Unlike commuters going to work, some of whom take advantage of the flexible time system adopted by their companies, most students, especially when going to school in the morning, tend to take trains in the same narrow time band. Since the supply of residential houses in Japan is so poor that it is not easy for families to move to places more conveniently located for their children to get to school, it is common for students to spend more than 1 hour on a train ride to school every day.

When fares are compared, commuter tickets for students are substantially cheaper than those for working commuters. This is another factor boosting railway usage by students. For other travel by train, the JR group offers a variety of discount tickets catering to students. For example, a book of multiple discount tickets that enables holders to ride as long as they want but can only be used for local trains is very popular among university students, although people with jobs may find it too tough to travel on these tickets.

Travelling in one's youth should give precious social experience. From that perspective, it can be said that the railway, a cheap and safe means of transport, supports such activities of young people. Furthermore, the railway offers students discounts for journeys longer than a certain distance, which saves students a lot of money when they travel a long distance. This is another example of how the railway encourages young people to choose trains when starting out on travel.

3. From commuting to information medium

However, over the past several decades, the railway has lost a considerable number of passengers and freight to cars and trucks. This trend has been common to most industrialized countries including the USA, and Japan, even with such a small land area, has been no exception. Basic factors behind this shift from railway to car included improved expressways and cheaper cars and petrol. This means that people preferred the convenience of door-to-door services—customization of means of transport for each individual—to the idea of sharing mass transportation like the railway.

On the other hand, there have been negative effects of the automobile on the environment, such as exhaust pollution and noise in residential areas. In addition, the small capacity of roads and parking space compared to the number of cars has created increasing problems such as traffic congestion and shortage of parking space, which could undermine the advantages of auto transport. These disadvantages are surfacing especially in Japan's urban areas.

Under such circumstances, there is a trend in recent years for people to return to railway transport. For example, even in Los Angeles, a city regarded as the symbol of the auto culture, people are beginning to re-examine railway transport, although only partially. Several programs have started in Japan re-evaluating the role of trams as a means of urban transportation, and discussing the possibility of introducing a new transport system that will cost less to construct. It is possible, though, to compare railway and cars from a broader perspective. The two can be compared not just as a mere means of transport but as a medium of information. While roads and parking lots are not places where people meet other people, but rather are just individual spaces, the railway provides people with chances to meet other people at stations. Even train

carriages themselves are more of a place to meet people compared to cars. Therefore, it could be worthwhile to pay more attention to the information aspect of the railway, instead of merely considering it as a means of commuting.

Quite often, there have been cases where towns developed centered around railway stations. In other words, it is the inherent nature of railway stations to function as information centres. People are attracted to places where information gathers. And places where people meet are the foundation of society. The railway has unintentionally provided such environments. We need to re-evaluate the functions of the railway as an information medium as we move toward the information era.

4. Future services

One of the themes touched upon during my course of lectures at Keio University on traffic, transport and information, is railway services in the near future. I discuss whether a modal shift from automobiles to the railway will be possible, and if it is, what preconditions should be required. In this discussion, however, I use the phrase, modal shift, for its original meaning, referring, therefore, to not just freight transport, as commonly interpreted, but to passenger transport as well. Those engaged in the railway business must be aware of many problems lying in their way. But from the viewpoint of universities, we want the seed-oriented services offered so far to be replaced with more needs-driven ones. One suggestion might be that the JR group should adopt what is called a patterned timetable, which has already been used by other private railway companies. JR has used such timetables for shinkansen since the beginning of the services, but many of the more crucial commuter lines have not.

The railway services should be comprehensive ones that would combine the hardware aspect of facilities such as stations and train carriages and the software aspect of train schedules as well as the human interface such as communications between the railway staff and passengers. We should study from the perspective of users what railway services should be like. For example, the current services seem to be designed for use just by grown men in good health. The dean of our faculty says he realized how inconvenient railway stations were for commuters when he had to come to work on crutches after suffering an injury. Similarly, we can imagine what it would be like by listening to foreign visitors who do not speak Japanese or to visually-handicapped students about their journeys on trains.

A considerable part of station facilities are actually designed to restrict the movements of passengers for the purpose of collecting fares. True, it is essential to prevent passengers from boarding trains without paying fares. But if that means forcing passengers to bear inconvenience, the railway will surely lose some customers.

It is said that non-contact prepaid cards will soon be put to practical use in Hong Kong; this is a system Japanese railway companies need to consider as soon as possible. I had the opportunity of visiting the Railway Technical Research Institute a while ago, when I was told that a certain level had already been achieved.

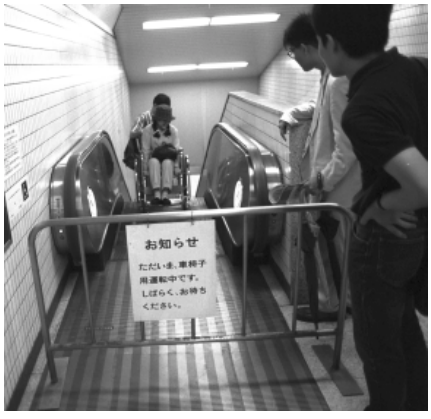
Another issue is that railway schedules in Japan are extremely tight—so much so that a minor accident disturbs the whole timetable. And responses taken in such cases do not work well. This is because the railway uses a centrally-controlled service operation management. Generally speaking, it is better to use distributed management to control any system with a large-scale, complex structure. A distributed network with module structures would help prevent local accidents affecting the whole system.

If we talk more specifically about an example, it would be more flexible to have facilities and timetables where passengers can change trains simply by walking from one side of the platform to the other without going up or down steps, than to have trains running on those two different lines combined into a single line making the timetable complicated. In my course on traffic, transport and information, more than one guest lecturer has discussed different ways to enable passengers to change trains without using staircases. Let me repeat. The key to realizing well-balanced railway services in the near future is how the services can be offered from the standpoint of those who enjoy them rather than those who provide them.

5. Student research projects at Keio University

At SFC, students are engaged in a variety of research projects. One is called the RE project, which studies railway environments. As mentioned earlier, the current railway facilities assume grown men in good health as their sole users. The elderly, infants, pregnant women, handicapped people, foreigners and those carrying heavy luggage may find parts of the facilities not necessarily designed for their convenience. The project

■ Facilities for handicapped *(Keio University)*



■ RE project: using wheelchair *(Keio University)*

■ The Shonan Liner *(Keio University)*

■ Hiroshima Tram *(Keio University)*

purpose was to conduct research on actual examples of such facilities and to come up with specific suggestions to improve them.

The students were fairly active in their research, interviewing people at government agencies and observing many stations and train carriages. They also used questionnaires to conduct social surveys. Research was also made into facilities and mechanisms for the handicapped. Some students actually tried using a wheelchair during train rides for themselves. The results of their research were presented at the university festival in the autumn, as a presentation for group activities in some classes, and in the form of a report.

The next challenge will be to come up with ways to feed the research results back to the people involved in the railway services. One project that students have been working on enthusiastically is research into the Shonan Liner. In the neighbourhood of the Fujisawa and Tsujido stations, where our campus is located, many residents commute to metropolitan Tokyo every day. If they can buy a ticket for a reserved seat in advance for the Shonan Liner, they have a much easier time during rush hour. So the students conducted a survey of users of the advance booking system.

By using questionnaires, they asked what would be a reasonable price for booking a seat, by what method reserved tickets should be sold, and other questions. The survey found that many users of the Shonan Liner want the current system to remain in place. The result was somewhat disappointing to the students, who had expected to propose introduction of a lottery system among applicants, instead of the present system where people wait in a long queue. However, it would be unwise to rush to a conclusion over what system is most desirable, unless the survey also asks the opinions of those who are not using the tickets currently but would do so if the system were changed. There are several issues that remain untouched, including the question of what effect it would have if different fares are charged in different time bands, a system used by British Rail and others. Here again, surveys conducted from the standpoint of users should have great significance, and this could be regarded as a role universities could play.

6. Trams

Students at Keio University take group trips during the summer vacation to study railway environments. In 1993, they travelled around the Kyoto and Hanshin region, using just about every train line available in the area including the Hankyu railway, in an attempt to get hands-on experience of the reportedly-good services offered by the private railways in the Kansai region. What impressed them was stations with no speck of litter, as well as good facilities for handicapped people.

In 1994, students visited Hiroshima to study trams in service there. They quite enjoyed this study trip because they saw A-bombed carriages still in use, and found trams with all kinds of carriages collected from across Japan and even from Europe. Trams are easily affected by car traffic jams since they share roads with cars. Therefore, unless there is a rule giving priority to trams over cars on roads, the trams' advantage of guaranteed scheduled is lost. In Japan, a number of cities abolished trams in the 1960s and 1970s, but European cities still use trams. Hiroshima, therefore, is important in the sense that it is one of the few towns in Japan where trams are still in full operation. It would be worthwhile to re-evaluate trams as a means of urban transport and to compare them with buses. Trams are advantageous especially in terms of environmental friendliness when the amount of exhaust gas is compared. As we shift from an industrial society emphasizing efficiency to an environment and information society stressing humanity, the return to the railway may be seen in trams as well.

7. Multimedia information and railway

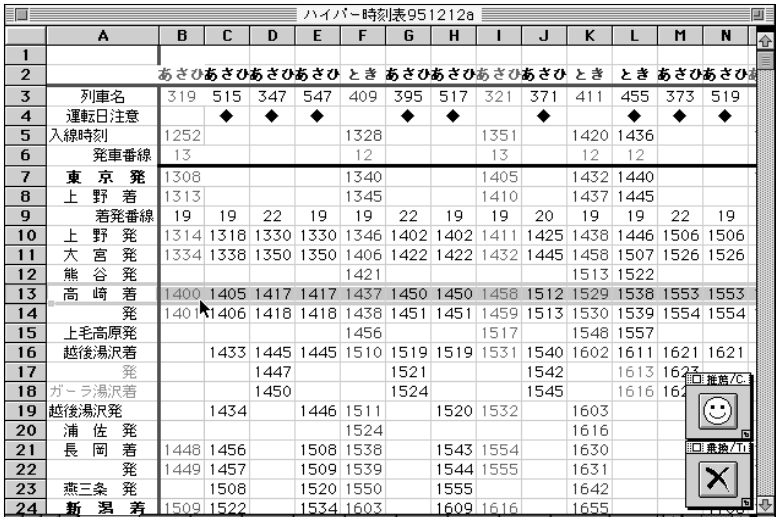
Multimedia, a buzzword in the mass media lately, has a great deal to do with the railway. What multimedia means

originally is to operate digital information interactively through information communication networks. Therefore, the aspect of the railway as information medium involves such new electronic information media. One possible development in this regard might be broader use of multimedia in railway-related information services. This relates to information for both passengers and staff engaged in operating railway services. The railway-related information, which has been provided using characters and numbers so far, could be offered by images. One idea might be an electronic version of train timetables, in which people can gain access to information on train schedules dynamically from a computer screen. Our research team is presently in the process of producing a prototype of such a system which we call "Hyper Timetable". Visiting researchers from JR East are working on visualization of information on railway operations. Their experiments include visualizing sales information at each station as well as building a system to show fluctuations in the number of passengers using data from a device on-board each train to assess the number of passengers. Use of multimedia information processing is expected to increase as a form of information service in a future network society. R&D on information services related to the railway should be in line with this trend.

8. Conclusion

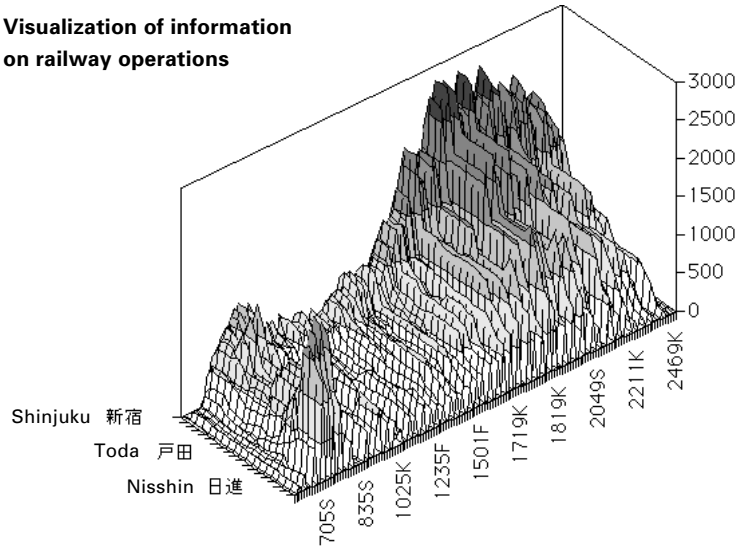
Japan is becoming a more aged society than the USA and European countries. The railway will have an important role to play as a means of transport and a medium for exchange of information. Preparations should be made to improve railway services based on these facts. Cooperation between universities and railways should lead to a successful result. ■

"Hyper Timetable" image



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2		あさひ	あさひ	あさひ	あさひ	とき	あさひ	あさひ	あさひ	あさひ	とき	とき	あさひ	あさひ
3	列車名	319	515	347	547	409	395	517	321	371	411	455	373	519
4	運転日注意		◆	◆	◆		◆	◆		◆		◆	◆	◆
5	入線時刻	1252				1328			1351		1420	1436		
6	発車番線	13				12			13		12	12		
7	東 京 発	1308				1340			1405		1432	1440		
8	上 野 着	1313				1345			1410		1437	1445		
9	着発番線	19	19	22	19	19	22	19	19	20	19	19	22	19
10	上 野 発	1314	1318	1330	1330	1346	1402	1402	1411	1425	1438	1446	1506	1506
11	大 宮 発	1334	1338	1350	1350	1406	1422	1422	1432	1445	1458	1507	1526	1526
12	熊 谷 発					1421					1513	1522		
13	高 崎 着	1400	1405	1417	1417	1437	1450	1450	1458	1512	1529	1538	1553	1553
14	発	1401	1406	1418	1418	1438	1451	1451	1459	1513	1530	1539	1554	1554
15	上毛高原発					1456			1517		1548	1557		
16	越後湯沢着		1433	1445	1445	1510	1519	1519	1531	1540	1602	1611	1621	1621
17	発			1447			1521			1542		1613	1623	
18	ガーラ湯沢着			1450			1524			1545		1616	162	
19	越後湯沢発		1434		1446	1511		1520	1532		1603			
20	浦 佐 発					1524					1616			
21	長 岡 着	1448	1456		1508	1538		1543	1554		1630			
22	発	1449	1457		1509	1539		1544	1555		1631			
23	燕三条 発		1508		1520	1550		1555			1642			
24	新 潟 着	1509	1522		1534	1603		1609	1616		1655			

Visualization of information on railway operations



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