

Consideration about Successful Introduction of Smartcard: A Comparative Case Study of IC Card Business in Shikoku

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Abstract

Smartcards used in public transportation services in Japan now is more than e-Ticket; it works as e-Money and provides strong marketing tool. Railway operators are in a position to utilize the smartcard in restructuring their transportation business by reducing personnel expense, and increasing services to riders. Bound with the function of e-Money, and/or loyalty program (a points program) embedded in the smartcard pass, the benefits are not limited to restructuring but also expanding the scope of businesses. For example, Kotoden in Kagawa, a small rural regional railway operator, intends to utilize the IruCa smartcard system for the benefit of the regional economy. Iyotetsu in Matsuyama, another local operator in Shikoku, is using the IC e-Card as to collect marketing information for its subsidiary department store. This paper discusses factors for the successful introduction of smartcard. A comparative analysis about Kotoden and Iyotetsu is used for this purpose.

Keywords: Smartcard, e-Money, Loyalty Program, Felica, NFC, Electronically Registered Account Receivables

1. Introduction

Smartcard systems in Japan are rapidly deepening diffusion to every activity of daily lives. The root of this widespread use date back to 2001 when Eastern Japan Railway Company adopted “Suica” (Super Urban Intelligent Card)¹ replacing paper and magnetic tickets. Nowadays similar kinds of smartcard in “card” shape as well as mobile telephones are used widely not only in metropolitan areas but also remote rural regions such as in Shikoku Island.

In Shikoku, although (or because of) it has a small population (about 4,280,000), the adoption of a smartcard system presents an interesting comparative business case about two ongoing projects – the case of “IruCa” of Takamatsu-Kotohira Railroad Co., Ltd. and “IC e-Card” of Iyo Railway Co., Ltd. This case attracts attention of railway operators all over Japan because it is considered to be the test-bed for a larger scale business model in the introduction of traffic smartcard system and expanding the system to e-money.

This paper presents a comparative case study about “IC Card” in Shikoku. Before starting, however, there should be a definition such as follows: smartcards in the form of a “card” is usually called an “IC Card” and the one which is embedded in mobile phone is called “Osai-fu-Keitai2 (Wallet Mobilephone)” in Japan, however, “IC Card” referred to in this paper means both sense. This is because of the consideration about the technology behind the cases dealt in this paper. All of the smartcard technologies dealt with in this paper depend on Felica³ standard developed by Sony Corporation. In other words, this paper looks at the different business strategies adopted by two players who use the same Felica technologies but bring different applications and are aiming at different goals.

¹ Suica is a registered trademark of Eastern Japan Railway Company

² “*Osai-fu Keitai*” is a registered trade mark of NTT DoCoMo.

³ Felica is a registered trademark of Sony Corporation.

In accordance with the above definition, this paper looks for the success factor for the introduction of smartcard. In order to do so, first, this paper will illustrate the recent development of the use of smartcard in Japan. Felica was first used in Hong Kong as MRT e-ticket – a well known “Octopus Card.” After looking at the convincing success, East Japan Railway Company brought in the Felica into the Tokyo metropolitan area on a large scale as Suica. Since then, Suica has been playing the leading role of smartcard in Japan. In parallel to this development, Felica was used in another widely spread business – an e-money business called “Edy.” This paper especially focuses on the relation of these two – e-ticket and e-money.

Secondly, the case about “IruCa” is presented. “IruCa” is used by Takamatsu-Kotohira Electric Railroad Co., Ltd. It is an adoption of the Suica standard to a local rural railway operator. It is interesting, however, because IruCa is not a mere transplant of the Suica system but a unique expansion benefited from the technical nature of the smartcard system. It can be found in its unique fare schedules.

Thirdly, the case of “IC e-Card” system of Iyo Railway Co., Ltd. is presented. In contrast to “IruCa,” “IC e-Card” of Iyo Railway Co., Ltd. is not following the Suica standard. They instead developed their own system and adopted unique business model. Their business model can be described as a “horizontal integration model.” The characteristics and aims of their model are illustrated.

Finally, this analyzes the two business models. By doing so, this paper envisages the factor for the successful introduction of a smartcard system. In the analysis, there is a consideration about the benefit of network externality followed by the consideration about technology factors. Then, an insight about the future of the money – “Electronically Registered Accounts Receivables” – is presented.

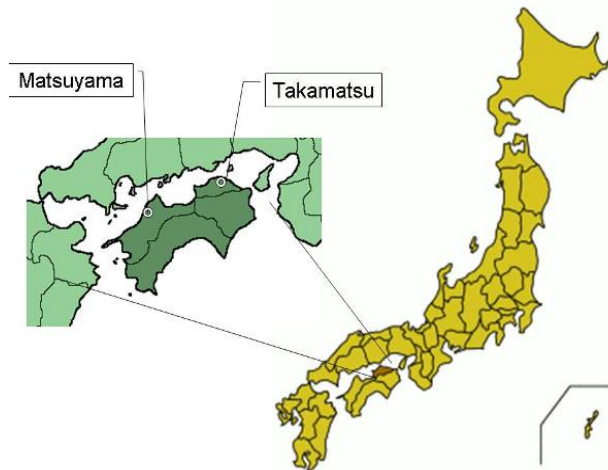


Figure 1. Location of Matsuyama and Takamatsu

2. Literature Survey

There are numerous studies about smartcard systems and applications. Giuliano & Moore (1996) presents results from an extensive study about FOT (Field Operational Test) of Californian public transportation in 1996. They conducted a comparison between contact smartcards and contactless RF cards. The conclusion was that contactless RF cards were both more reliable and preferred by users.

Recently, a lot of research has focused on various aspects about the application of traffic smartcards in electric payment systems. For example, in 2005, the Policy Research Institute for Land, Infrastructure and Transport (PRILIT), a part of the Ministry of Land and Transportation (MLIT), published a policy research paper titled “Research on the Introduction of a Common Traffic IC card in East Asia.” In this paper, they present extensive findings about existing smartcard systems in Japan. They also report on the experiment which they have conducted in multinational environment (PRILIT, 2005). The experiment involves three nations – Japan, Singapore, and Hong Kong, and used a smartcard with Felica

system to test the possibility of developing multinational use of one smartcard. The result indicates that developing business of multinational smartcard is feasible, and clarified problems with technology and legal systems.

As for smartcards which are embedded in mobile phones, Zmijewska (2005) provides analysis about mobile payment. Using the case of NTT DoCoMo's Felica to represent NFC (Near Field Communication) technology, it provides an analysis from "customer centric measurement." However, there were no perfect technologies which fulfill all "criteria of customer centric test," Felica is judged to be the promising technology.

To the best of my knowledge, this paper is the first research about two different railways operator who adopt different business models of smartcard systems in a typical rural and local business environment.

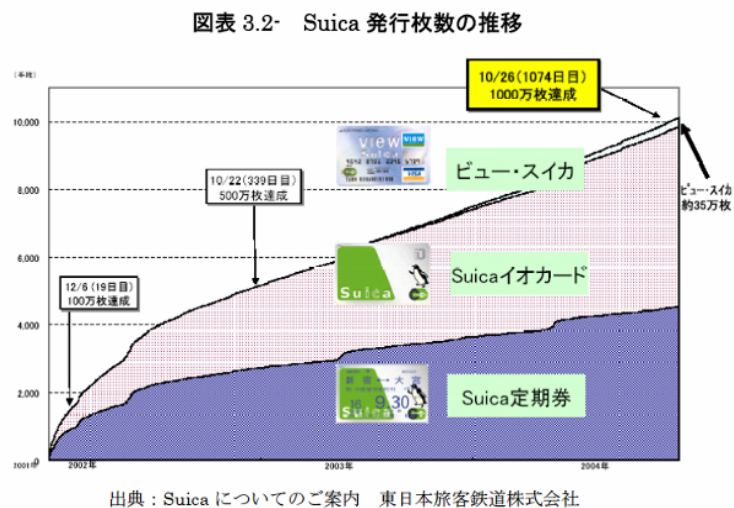


Figure 2. Numbers of Suica Issued (adopted from METI, 2001)

3. Recent Development of Smartcard in Japan

3.1. Diffusion of Smartcard

2007 will be marked as the “Year of e-Money” in Japan. PASMO was introduced as the service to cover all the public transportation services in and around Tokyo. This comprehensive alliance started on March 18, 2007. As a result, about 30 million smartcards can be used as traffic passes over a metropolitan transportation network of 106 companies, and can be used as e-Money at 11,000 SUICA-ready stores and 1,300 PASMO-compatible stores (PASMO Council, 2006). In addition, All Nippon Airline (ANA) announced that it will establish an alliance with PASMO to mutually accept and transfer points from mileage services in March 2007 (ANA, 2007). The impact of introducing PASMO has been tremendous. On the first day, more than half a million PASMO were purchased (Nikkei, March. 20, 2007). The number of card purchases soared to more than one million within four days (Nikkei, March 24, 2007). Within fortnights, it exceeded more than two million (Nikkei, April 8, 2007). As a result, the stock of smartcard nearly ran out and they were forced to limit the new issuance only to “registered PASMO commuter pass” (Nikkei, Sangyo Newspaper, April 12, 2007).

On April 23, 2007, Seven & i Holdings Co., Ltd. – one of Japan’s top retail conglomerates and the operating corporation of Seven-Eleven CVS– launched their own e-Money “nanaco” (Nikkei, January 17, 2007). This is going to create a huge impact in this market because of the volume – they are going to issue 10 million IC cards as the first step. Furthermore, Seven Bank Ltd., a subsidiary company of Seven & i, runs more than 12,000 of their own ATMs. All of them will be the end terminals where customers of “nanaco” gain the services (Nikkei, April 24, 2007). Also, Nikkei reports Aeon Co. Ltd., started accepting Suica and other *Osai-fu-Keitai* payments in Tokyo area starting from April 27, 2007 with their e-Money, called “WAON”, and will expand to include 3,700 stores within 2008 (Nikkei, January 24, 2007).

3.2. Background of the Growth

It is true that, prior to this year, e-Money such as Edy and Suica were available in the Japanese market for a while. Edy, run by bitWallet Inc. using Sony's Felica system, was established in 2000, while Suica, run by East Japan Railway Company was introduced in November 2001 after several years of trials. In November 2003, trial use of Suica as e-Money started and was officially introduced in March 2004.

The use of Suica as e-Money was boosted when East Japan KIOSK were equipped with readers in July 2004. After that Suica's sales mushroomed. Suica expanded from stations to establish business alliances with convenience stores, restaurants and other retailers. By the end of March 2006, 15.7 million Suica cards were issued. In November 2006, transactions on an average day totaled 260,000. By the end of March 2007, the number of Suica issued exceeded 20 million (Nikkei, April 11, 2007).

As for Edy, even though its e-Money services started much earlier than Suica's, the penetration did not show smooth growth. For example, although am/pm Japan Co., Ltd., one of the largest convenience store chains, started to accept Edy in November 2001, the number of issuances indicated a moderate increase. A remarkable boost came from the result of alliance with ANA in 2003. Paralleling to the increasing numbers of Suica, Edy also increased. By the end of March 2005, about 10 million Edy were issued. Transactions per month totaled about 7.1 million. By the end of March 2007, the number of Edy soared to 27.9 million. The stored and paid value in 2006 totaled JPY100 billion (Nikkei, March 28, 2007).

図表 3.2-2 Edy の発行枚数と利用件数の推移

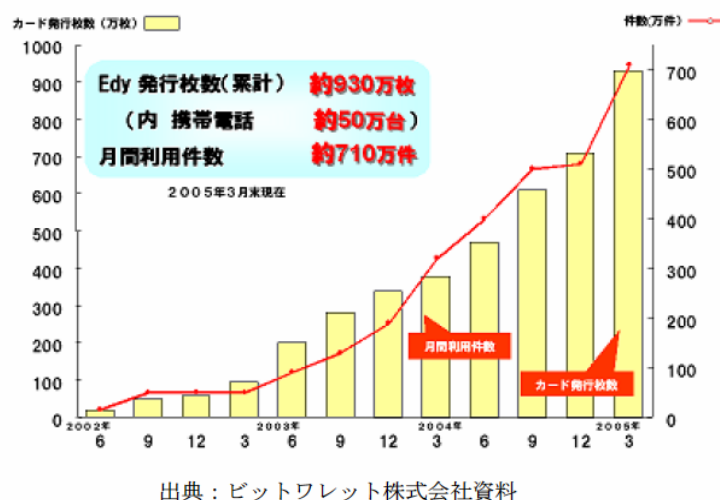


Figure 3. Numbers of Edy Issued (adopted from METI, 2001)

3.3. “Points Economy” or “Corporate Money” and Alliance

Mileage programs or loyalty programs are often referred to as “point card system” in Japan. The name is a simple reflection of the function to accumulate points (mileage). Usually the value is stored in the card or retrieved over the network. Starting from airline companies, credit cards, mobile phones, restaurants, cooperatives, to all sorts of retailers, these loyalty programs have been developed as incentives to bring customers back to them. Because many of them are networked mainly thanks to the development of networked society, the characteristic of the “point card system” is undergoing metamorphosis. It is now becoming “Corporate Money” or e-Money issued by corporations, and creates a “Point Economy” (NRI, 2006).

It used to be the richness of alliances that worked as a determining factor for consumers to decide what loyalty program s/he intends to join. The more compatibility a card has, the more probable the card is chosen. Therefore, the first strategy was to segregate one’s own program from the others. For example, Suica did not make a direct alliance with Edy. However, as the web of alliance

among providers became more complex, each inevitably became connected in some way, intentionally or not. For example, “Poi-tan” provides a portal service to look for the path to transfer one loyalty program to another, for free. (POITAN, 2007)

ANA and PASMO’s alliance will create a path to bridge Edy and Suica. What does this mean? The segregation strategy or the use of loyalty programs to secure customers exclusively to one’s system is not effective. The participants of the program already gained the power to choose, despite the intentions of program providers.

4. Case 1: “IruCa” of Takamatsu-Kotohira Electric Railroad Co., Ltd.

4.1. Company Profile

Takamatsu-Kotohira Electric Railroad Co., Ltd. (Kotoden) was established in 1943 as the result of a merger of three local railroad companies around Takamatsu City of Kagawa Prefecture under the wartime regulations. It had extended the railway to reach a total of 60km in the 1950’s. By the end of 2006, it owned 88 cars. In FY2005, it recorded sales of JPY 3.6 billion with paid in capital of JPY 250 million. The transportation density in 2002 was 5,472 people per km. In the course of business expansion, Kotoden merged local bus companies and established taxi companies as well as to go into retail business and hotel businesses.

There was an unfortunate down turn from the late 1990’s to the early 2000’s when Kotoden’s department-store joint venture with Sogo went bankrupt. Eventually, Kotoden itself went bankrupt in 2001, due to the heavy burden raised from the default of the department store. It went through a restructuring process until March in 2006. Now Kotoden Group includes railroad, bus, taxi and some retail shops.

In its railway business, Kotoden carried about 6.519 million passengers in the first half year of FY2006, which was an increase of 0.2% compared to 6.507 million of the previous year. Income for the same period amounts JPY 1.275 billion, which was a 0.2% increase compared to 1.273 billion in the previous year.

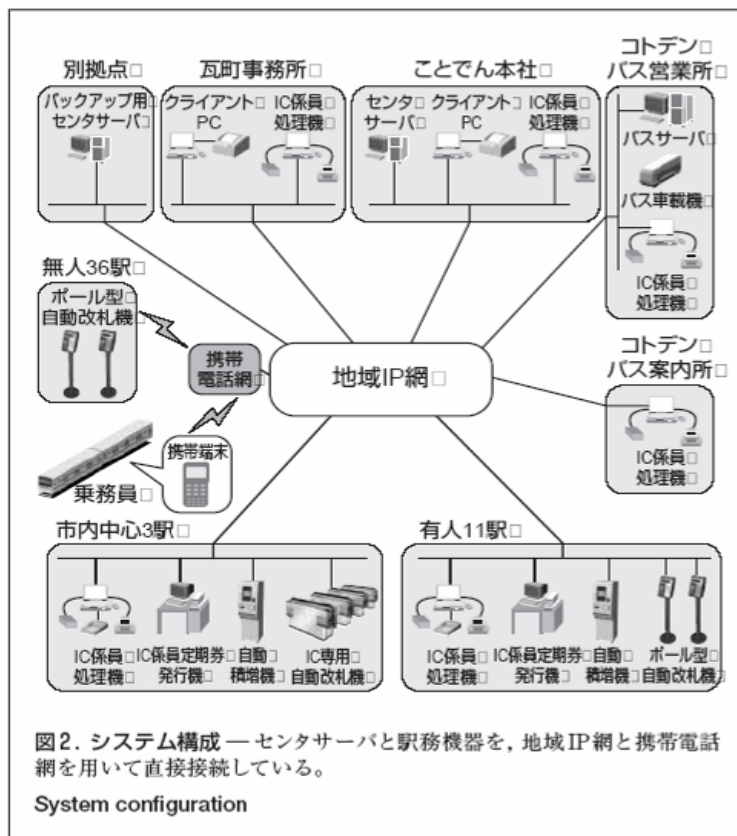


Figure 4. System configuration of IruCa (adopted from Naruse & Saito, 2006)

4.2. “IruCa” System and Business Model

“IruCa” is the name of the smartcard pass introduced by Kotoden. Kotoden started to use this system on 2nd February 2005. “IruCa” complies with the standard defined by CJRC (Congress of Japan Railway Cybernetics) while

maintaining simple structure reflecting both the small scale of company and the light volume of traffic (Naruse & Saito, 2006). Figure 4 illustrate the overall configuration of the system.

Because simplicity is the most advantageous characteristic of this system, only one center server for each railway and bus (with a set of backup systems, as a matter of course) takes responsibility for managing all data. Equipment at stations is for processing transactions only. The data are retrieved and sent over either regional IP network or packet communication network over mobile phone.

The investment for the construction totals to JPY 812 million, including, gates, handy terminals, servers, charging and re-charging machine, network, and software. This was the first operating smartcard system built in Japan outside metropolitan area, which is applicable to both railway and bus. Sixty percent (60%) of the construction was paid by subsidies.

4.2.1. Characteristics as e-Ticket

As mentioned above, IruCa is the first smartcard in real operation, which can be used seamlessly for railway and bus transportation. This is a difficult challenge for small and rural operators with very limited resources to invest. However, Mr. Kawakami, Executive Director in charge of operations, explains this limitation is the very reason why they needed to introduce IruCa system.

Before introducing IruCa system, they submitted a proposal for “Kouzou Kaikaku Tokku”. In this proposal, they set the objective of introducing smartcards to remove barriers of transit between public transportation such as railway, bus, ferry, etc. As a consequence they expect to develop new businesses, such as to create new utilization of mobile phones, to enhance alliance among regional industry to promote tourism, and to reduce the use of cars for improving the environment. In short, smartcards were not only considered to reduce the operational burden of Kotoden but also considered to contribute to the development of regional economies.

The characteristics of IruCa can be summarized in three categories. From the passenger’s perspectives, fee scheduling is a significant feature. From the perspective of Kotoden, there are two features: The reduction of operating costs and developing new strategies.

4.2.1.1. Fee Scheduling

Kotoden aimed to transform fee schedules by introducing IruCa. With IruCa, Kotoden entirely transformed the discount structure. They introduced increasing discount scheduling for the first time in Japan regardless of the categories of passes. The details are shown in Table 1. The basic characteristics of this new scheduling can be summarized as deepening discounts in line with frequency. In other words, as frequency increases, the customer gets more discounts for the ride. In addition, Kotoden designed the fee structure so that seniors benefit the most. Furthermore, because buses are well developed and considered complementing the use of railway, discount rates for bus fee is more than that of railways.

Table 1. Fee Discount Schedule of Different Types of IruCa

Types \ Frequency of Use per Month		1 – 10 times	11-30 Times	31-40 times	41-50 times	51 times and more
“Free” IruCa	Railway	5%	10%	20%	25%	30%
	Bus	10%	15%	20%	30%	40%
“Senior” IruCa	Railway	5%	20%	30%	35%	40%
	Bus	15%	30%	35%	45%	55%
“School” IruCa	Railway	5%	15%	25%	30%	35%
	Bus	15%	25%	30%	40%	50%

*“Free” IruCa is a multiple pass. “Senior” IruCa is only available for over 65 years old. “School” IruCa is available to students.

There are three other types of IruCa, namely, “Teiki” IruCa (monthly pass), “Kids” IruCa and “Green” IruCa (for challenged persons only). Figure 5 indicates the trend of issuance of IruCa. In the month it started, the number surpassed 30,000 and about eleven month later it surpassed 65,000 and by the end of March 2006, it was almost 70,000.

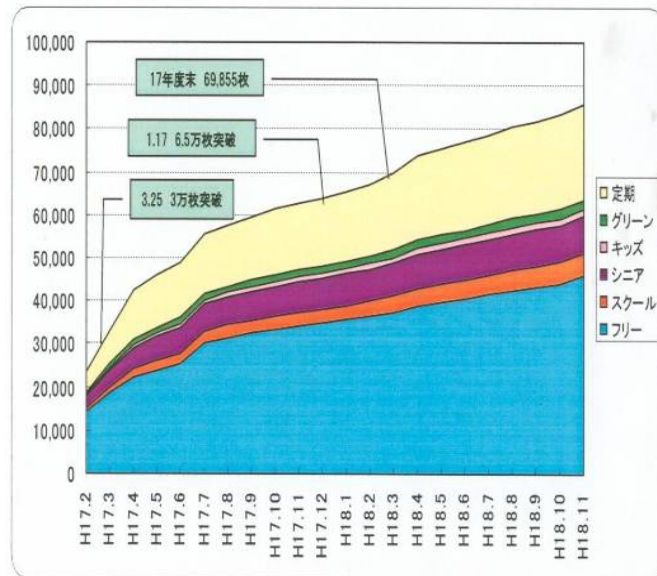


Figure 5. Trend of Numbers of IruCa issued

Figure 6 illustrates the numbers of IruCa issued in proportion to types. “Free” IruCa consists of 54% of the total. This type is the only IruCa which can be issued anonymously. Other types need identification of the holders and can be used only by the registered holder.

Nearly 80 percent of all passengers use either types of IruCa, and uses of paper tickets are steadily decreasing. Kotoden is expecting revenues to increase in FY2006 by at least JPY20 million. According to their analysis, the increase of revenue is largely due to the increase of passengers. “Senior” IruCa users also contribute to the increase in the number of passengers.

The number of passengers on shuttle buses between the city center and shopping malls in the vicinity indicates a 20 to 30% of increase. Those shoppers mainly consist of middle aged to senior women, who fast learn about IruCa by word of mouth.

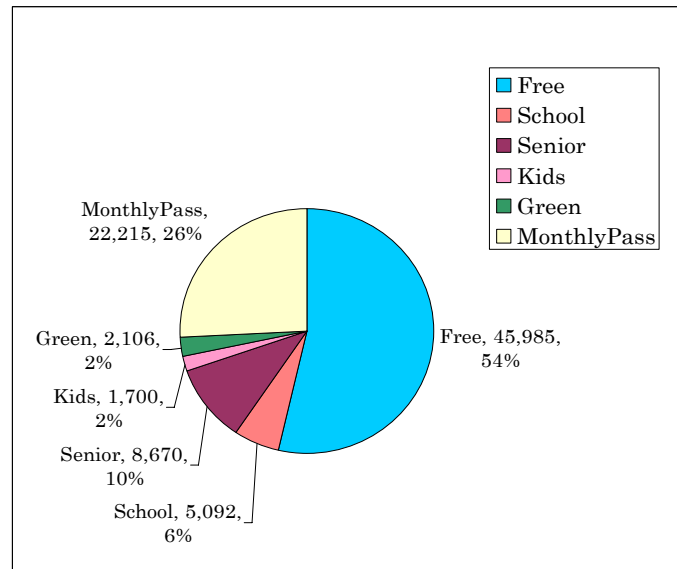


Figure 6. Number of IruCa issued by type (end of November 2006 by Kotoden)

4.2.1.2. Reducing Operating Costs

The introduction of auto-gates significantly reduced personnel expenses. In FY2005, savings amounted to JPY 74 million. This was the result of reducing station staff by 16.5 percent.

Apart from the direct reduction of personnel expenditures, the low maintenance cost of gate equipment created another savings. Because the gate system of smartcard does not require periodical maintenance due to its simple structure, unlike previous system which often jammed, both regular maintenance cost and the loss from non-operating machines were reduced. Although the cost cannot be counted directly, they can estimate the cost savings from their

experience.

Another cost reduction is the reduction in time necessary to collect a passenger's bus fare, and to give back change when needed. Although this is hard to measure, or is not very practical to spend money for such purpose, bus drivers assert the improvement in reducing transaction time. In addition, this reduction of time contributes to an increase in punctuality. Furthermore, as more passengers use IruCa, less change is needed to be carried.

4.2.1.3. Developing New Strategies

The data from each gate system is sent to the server every 30 minutes. The database is accessible to all authorized company officers at headquarters via groupware system. The financial data for daily basis is also accessible to all officers on the next day. Mr. Kawakami considers this "*Mieru-ka*" (visualization) to be a very important managerial tool. By making all the data accessible to everyone, each member of the company knows what environment their business is facing. It is apparent to everybody which lines of the bus network generate revenues, and which stations are busy and vice-versa.

Strategies such as relocating personnel at stations, or changing the length of cars in accordance with lines and time are effectively structured and adopted. The daily revenue data is a real time data. It is now possible for them to launch new strategies in a very short time using real time data. Presently, they are utilizing the data to prepare new fee scheduling, enhancement of transportation capacities. Furthermore, revenue data is effective in the management of financial planning.

4.2.2. Characteristics as "e-Money"

IruCa was also originally designed to be used as e-Money. On 1 November, 2006, an experimental use of IruCa in Takamatsu city's shopping streets started. This is the Japan's first field experiment supported by METI (2001). The first participants were 26 shops with 30 reader/writer terminals, and one department store with 20 terminals. Because this was a field experiment extended through

city’s central shopping malls, association of store owners selected participating shops. Apart from shops, vending machines compatible with IruCa payments were placed at and around major stations, and two car parking lots which accept IruCa payment were in operation.

As of December 13, 2006, about six weeks after this experiment started, average sales were JPY 134,601, with average use of 385 per day. The average amount of payment per transaction was JPY 620.6 for stores and JPY 115.8 for vending machines. The average number of transactions per day was 178 for stores and 207 for vending machines. Figure 7 illustrates Total Sales and Number of Transactions by Category of Businesses. Transactions on vending machines consist of more than half of transactions whereas sales are contributed more from the business of food/drink category.

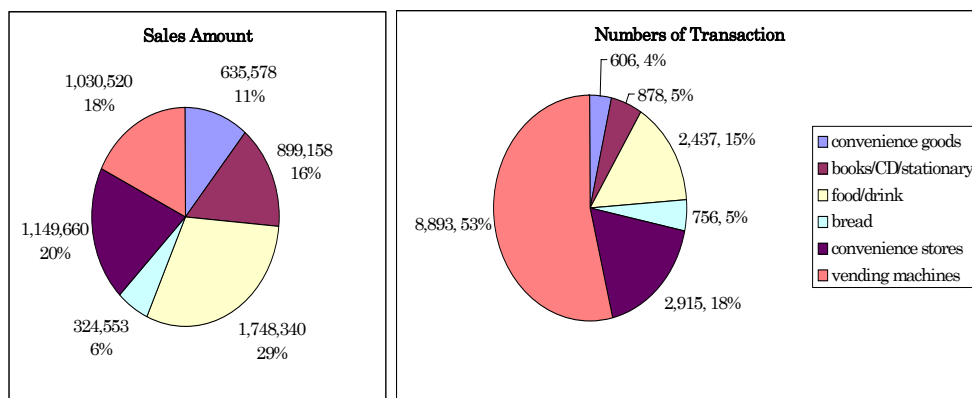


Figure 7. Total Sales and Number of Transaction by Category of Businesses [as of Dec. 13, 2006]

5. Case 2: “IC e-Card” of Iyo Railway Co., Ltd.

5.1. Company Profile

Iyo Railway Co., Ltd. (Iyotetsu) was established in 1887 as Japan’s third purely private railway corporation in Matsuyama City of Ehime Prefecture. Since then, it has extended the railway and tram services to reach a total of 33.9km and 9.6km, respectively. At the end of 2006, it owned 53 cars for railway services and 42 cars for tram services. Of the 42 cars of tram services, two locomotive engines and three passenger cars are included. In FY2005, it recorded sales of JPY 11.181 billion with paid in capital of JPY 1.5 billion. The transportation density for railway and tram in 2004 was 3,192 people per km and 5,143 people per km, respectively. In the course of business expansion, Iyotetsu merged local bus companies and established taxi companies as well as went into retail business and other businesses such as catering services, real estate, tourism, and restaurants.

They were involved in Sogo’s bankruptcy because they ran a department store with Sogo. However, unlike Kotoden’s case, the venture was mainly run by Iyotetsu’s capital. Therefore, they took advantage of this downturn by dissolving the alliance with Sogo and establishing a new alliance with Takashimaya. They made major investments in the renovation of the stores and surrounding environment including renovation of hub terminal of Matsuyama-Shi-Eki (Matsuyama City Station) in 2000.

Iyotetsu carried about 10.714 million passengers for railway business and 7.113 million passengers for tram business in FY2005. Income for the same period amounted JPY 1.991 billion for railway and JPY 814 million for tram. Iyotetsu carried about 13.776 million passengers in the first half year of FY2006, which was a 1.01% increase from the 13.506 million in FY2005.

5.2. “IC e-Card” and Business Model

“IC e-Card” is the name of the smartcard pass introduced by Iyotetsu. Iyotetsu started to use this system on 23 August 2005. “IC e-Card” system is

The system consists of five segments, namely railway (including tram), bus, taxi, Iyotetsu, and “e-Card Co., Ltd.” “e-Card Co., Ltd.” is a subsidiary of Iyotetsu specializing in the development and management of smartcard business operations.

5.2.1. Characteristics as e-Ticket

The IC e-Card can be used for railway, tram, bus and taxi services. The wider range of coverage attracted attention from railway operators as well as users and venders of smartcards all over Japan because there was no such a case which covered all transportation services in the community before the IC e-Card. This is due to the unique situation around Matsuyama. Iyotetsu is a conglomerate of transportation services in the vicinity of Matsuyama and is also a monopolistic corporation of public transportation services around the region. Furthermore, it has a long history. All of these accounted for the development of wide range of the coverage.

As for fee scheduling, Iyotetsu adopts 10% flat discounts on the passengers who use the IC e-Card. For tram uses and loop-line bus, additional cap pricing is applied. There have been cap pricing discounts for these services even before the introduction of the IC e-Card, and it was taken over.

The IC e-Card is Japan’s first smartcard ticket system, which was capable of installing on “*Osaiifu Keitai*” from the beginning.

5.2.2. Characteristics as “e-Money”

The IC e-Card was also originally designed to be used as e-Money. On 1 September, 2006, Iyotetsu Group started to accept payment by IC e-Card. By the end of 2006, the 17 places were accepting the IC e-Card. Among them, Takashimaya Department Store holds more than 20 shops and restaurants and is the largest retail complex. Because Iyotetsu engages extensive varieties of consumer businesses on top of public transportation, IC e-Card holders have a wide range of options. Apart from shops, vending machines compatible with IC e-Card payments were placed at and around major stations.

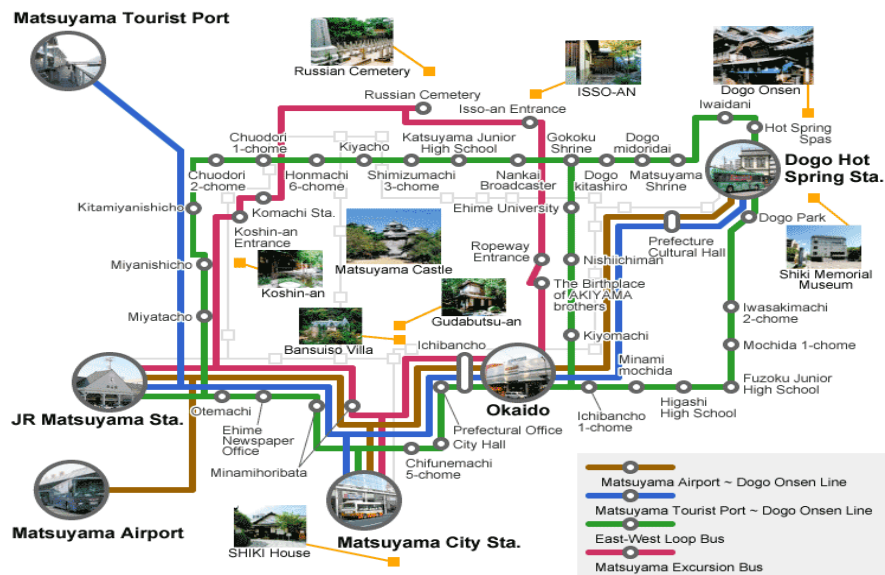


Figure 9. Iyotetsu Bus network in Matsuyama (adopted from Iyotetsu web site).

Figures about the use of IC e-Card in December 2006 are the followings. The total transactions in one month were 5,587 with average daily transactions totaling 180. Accumulated sales totaled to JPY 5.911 million, and average amount per day was JPY 190,168. The amount per transaction was JPY 1,058. Vending machines had just started operation and there is no statistics available. The statistics in relation to business category is not revealed.

On March 23, 2007, IC e-Card entered an alliance with Lawson CVS, and ten stores in Matsuyama City started accepting the payment with IC e-Card.

6. Analysis

6.1. De jure vs. Original Technology

A comparison of Kotoden and Iyotetsu is interesting as they adapt to different standard of smartcard systems. While Kotoden follows the CJRC standard,

Iyotetsu developed its own system without following CJRC. With this respect, an analysis was done to look at what different business model the two corporations develop and what would be the advantage and disadvantage.

CJRC is usually referred as “*Saibane-Kikaku*” in which “*Saibane*” is an abbreviation of Cybernetics derived from Congress of Japan Railway Cybernetics of Japan Railway Engineers Association, and “*Kikaku*” means standard. This standard is the *de jure* standard because it was developed by Eastern JR and used as Suica, and adopted many of JR systems. Also, it is adopted by almost all operators around metropolitan area including Tokyo, Nagoya and Osaka not only by JR companies but also private operators.

In the following section, a series of analysis is presented. Firstly, the role of technical restriction is presented. Secondly, the effect of the difference between network externality and module with Web2.0 is considered. Lastly, Felica and its role are considered.

6.1.1. Technical Restriction

The very reason why Iyotetsu did not follow CJRC standard derives from their operation in the bus business. Compared to railway transportation, bus networks are much more complicated. Often different lines reach the same destination taking different routes. In order to accommodate all the requirements needed by bus ticketing, a large memory capacity in smartcard was necessary. The memory allocation on the smartcard was not enough to make it compatible with bus ticketing if the CJRC standard was used.

For Kotoden, the same technical restriction as Iyotetsu applied to their bus services as well. However, what Kotoden decided was to develop a completely new set of fee schedules, which was explained in previous section. Even though Kotoden and Iyotetsu use the same Felica standard smartcard, they followed different strategies. The technical restriction due to the capacity of the smartcard led the two companies to follow different paths. This fact poses an interesting question to consider when deciding to introduce a smartcard system.

Radical changes from Business Process Reengineering (BPR) are usually accelerated by having information technology as important enabler (Grover, Fielder, & Teng, 1994). One of the business models can be regarded as a standard restructuring model. This is a type of standard business process re-engineering, through which old businesses are transformed so as to adapt to a generally accepted standard, and by doing so, the renovation of business processes are attained. These sorts of restructuring had been discussed in the context of research in the effective introduction of Information Systems (IS) such as Enterprise Resource Planning (ERP) package. Gibson et al shows two cases in which corporations preserved the process of the legacy system at the first step of introduction of ERP and then adapted to radical change.(Gibson, Holland & Light, 1999)

In practice, Kotoden decided to adopt the CJRC standard. By doing so, they faced the need to transform their fee structure of bus services and succeeded to develop a unique frequency-based discount scheme. This transformation may be exactly realizing what Hammer (1990) claimed “Don’t Automate, Obliterate.”

The other business model can be regarded as entrepreneur model. Instead of following an existing standard, Iyotetsu decided to develop its own smartcard system. There are several factors involved but among them, customer service was the decisive factor. In order to preserve the legacy fee structure, Iyotetsu could not use CJRC. Despite the initial cost for the bespoke system, Iyotetsu chose to avoid confusing customers.

Today, as both cases indicate smooth increase as long as the numbers of issuance of smartcard, and numbers of passengers, neither business model is facing severe troubles. However, the time span is still very short and further observation is needed.

6.1.2. Network Externality vs. Modularity with Web2.0

The technical restriction discussed above may be looked at from the perspectives of comparison between network externality and modularity. Because CJRC is a *de jure* standard, it enjoys positive feedback from so-called “network

externality” (Katz & Shapiro, 1994). For newcomers to participate in the CJRC system, the cost to develop a new system is the minimum as long as following CJRC’s business process. Facilities such as gates, value issuers, vending machines, and lockers have been developed by suppliers who can predict the market size so that safely make invests.

Traditionally, because of network externality, only one standard is considered to retain the dominant position. The dominance of Suica today seems to confirm this aspect. Furthermore, I heard at least one supplier of machines refused to take part in the development because they could not predict enough market size for the product designed for IC e-Card.

However, if we look at the situation from the perspectives of modularity, a different conclusion may be induced. In the present situation, where Web2.0 and long-tail market is a significant parameter, network externality only may not guarantee strong dominance to expel rebels. Thanks to Web2.0 the system development does not require a large investment. On the contrary, a sizable client server system can be developed. Modularity of the system will create a situation where long-tail emerges. The parts used in the *de jure* system are no longer specifically designed parts which has the limitation in the use. The very fundamental technology of contactless smartcard in Japan is depending on Felica system, and in this sense, CJRC’s *de jure* standard can even be defined as a subspecies.

6.1.3. Felica and its Role

Relating to the discussion above, the Felica system raises an interesting question. That is, how to judge what are *de jure*, and/or *de facto*, smartcard standard? Felica does not conform to ISO/IEC 14443 standard for “Identification cards – Contactless integrated circuit(s) cards – Proximity cards”, yet it conforms to ISO/IEC 18092 standard for “Near Field Communication (NFC).”

This fact itself is interesting to look at from the perspectives of an international public policy development. More importantly, Felica presents a

typical case of de facto standard. It started as “Type C”, which was not standardized, and has developed as the de facto smartcard for e-ticketing, then emerged to e-Money.

During the course of development, Philips and Sony had not only developed the NFC standard but also proved that money is a “**network goods**,” which can be controlled as sets of data and records. Furthermore, because e-Money is digitized money, the control of the system is mere application and development of communication protocols.

Although Felica is used mostly as the infrastructure for e-tickets and e-Money in today’s Japan, the very strength of it derives from its characteristics of being “not designed for plastic cards.” In all, it is worth noting that Felica has both the de facto and the *de jure* standards of the smartcard system.

6.2. With Core Business (Takashimaya) vs. Without Core Business

The structure of the business influences the structure of revenue as well as the business strategy. The background business environments for local public transportation operators in rural Japan are similar through out the nation. Most people tend to drive cars by themselves. Consequently, the numbers of passengers decrease to the extent to threaten maintaining profitable operations. Operators need to generate revenue from overall businesses not only limited to transportation but also expanded to retails and other services.

6.2.1. Iyotetsu with Core Business

Whereas the Iyotetsu Group has the core business of Takashimaya department store, Kotoden does not have such a facility. The revenue from Takashimaya is considerable. Therefore, one of the goals for Iyotetsu is to maximize the revenue from their department store. In order to do so, Iyotetsu tries to create a flow of people to Takashimaya. On the flipside of this, information about passengers who use IC e-Card when coming to the department store is the source of important

marketing data. It can be used to develop a grand vision as well as narrower range of strategies such as store design.

Since June 2006, Iyotetsu Takashimaya has issued “IC Rose Card,” which is a credit card with a loyalty program compatible with the IC e-Card. Unlike the ordinary IC e-Card, which is a “prepaid”- stored fair (SF) e-Ticket, they decided to make this card a postpaid one with an auto-charging function from the customer’s credit card account. Passengers who are members of “IC Rose Card” are willingly providing their information about traffic routing on top of shopping behavior when they use Iyotetsu transportation. Because almost all the customers have this card, the Rose Card presents very strong marketing capacity for Iyotetsu Group. Interestingly, the issuance of anonymous IC e-Cards is less common than the Free IruCa, its equivalent. It indicates that Iyotetsu Group wisely designed the merits structure of IC e-Card and Takashimaya Rose Card.

6.2.2. Kotoden without Core Business

On the other hand, without such core asset as a department store, a question may rise whether Kotoden could achieve an equivalent business strategy. According to Kotoden officials, they have adopted a strategy which sets public transportation business at the center. Therefore, they adopted the CJRC system and transformed the fee structure totally. They are interested in collecting data to understand characteristics of passengers, real time. Those are to be used for quick reflections of the needs of users, thusly, to tailor their business to attract and increase passengers.

It is quite persuasive to follow the idea mentioned above. However, I doubt that it would take long before the effect on revenue is realized. It seems to me that cutting costs plays a more important role in the case of Kotoden at this stage if we discount other factors.

6.2.3. Business Model for Fast Contact-less Smartcard

It is important to look at many aspects, especially benefits, of introducing a

smartcard system. Other than what was stated in the previous sections, an important factor for the fast contact-less smartcard derives from its time lag between the timing of value stored and the timing of service used.

According to Nikkei, January 24, 2007, participating corporations of PASMO are launched various loyalty schemes to let passengers use PASMO after March 18, 2007 when Suica could be used in the railway network of the PASMO group. Corporations are eager to increase the use of PASMO instead of Suica if the fees for rides are allocated in accordance with travel by passengers.

Revenue is derived more from financial aspects than from transportation operations. In other words, because all of these smartcards are SF, revenues from unused value stored considerably surpass the increase in actual numbers of passengers. This is very efficient means to generate revenue. Because the value to add on a smartcard is usually in specific and large units such as JPY1,000 and JPY5,000 while the usage is in small amounts, a large, unused value accumulates. Storing value on a smartcard is like depriving seigniorage from financial institutions. For instance, on August 29, 2006, The Nikkei Financial Daily reported about the decrease of coins in circulation due to the increasing use of e-Money. In FY2005, coins worth JPY218.2 billion were issued while JPY286.3 billion were returned. There was a deficit of JPY68.1 billion (The Nikkei Financial Daily, August 29, 2006).

The business model or surveys on institutions for fast contact-less smartcard involves a lot of aspects, and much research has been conducted (Chou, Lee & Chung, 2004, Kang & Lee, 2005, Iseki, Yoh & Taylor, 2006). However, it is worthwhile to look at the benefit raised from unused SF and consider a business model accordingly. In this consideration, care must be taken into account that under the Japanese legal system, e-Money, in general, has two faces. One is the aspect that e-Money as a prepaid card. Because it is regarded as a kind of prepaid card, regulation is under the jurisdiction of METI bound by prepaid voucher regulations. Therefore, as long as the issuers of e-Money fulfill the requirement about prepaid card, they do not worry about the consistency with financial regulations. The other aspect is e-Money as e-Ticket. Transportation tickets are

exempted from the prepaid regulation as long as the ticket is used to purchase the transportation services, and the corporations do not have to accumulate deposit as security.

6.3. Electronically Registered Accounts Receivables

The case study about Kotoden and Iyotetsu indicates the fact that the design of e-Money is still at the stage of use between Consumer to Business (B2C). Even if we take the example about Edy with Osaifu-Keitai – Edy to Edy –, it only provides an example of Consumer to Consumer (C2C) use of e-Money. However, once laws regarding “Electronically Registered Accounts Receivables (ERAR)” (Ogaki, 2005) are passed, usage will expand to include Business to Business (B2B) transactions. It will be a complementary payment mechanism of electronic trading.

Even though Financial Services Agency (FSA) expresses their aspect about ERAR as “not as a kind of e-Money” (FSA, 2006), considering the rapid development of NFC technologies and wide range of deployment of Felica as de facto standard, it is a logical conclusion that ERAR will be the next legal base for e-Money, which includes B2B network.

For example, cross border transaction will change accordingly. According to Nikkei, Seven & i Holdings entered an alliance with Mitsubishi-UFJ Bank in establishing “Trade Service Utility (TSU).”(Nikkei, January 23, 2007) Without depending on such a large system, ERAR using smartcard will enable export and import activities as simple as credit card payment in present as seen in the experiment by PRILIT(2005).

7. Conclusions and Topics for Further Research

In this paper, recent developments of Japanese smartcard-related businesses are discussed with a comparison of business structures of two railway operators in Shikoku. The expansion of the Felica system either in the form of *Osaifu-Keitai*

or plastic card is transforming the characteristics of Japan's e-Money market. So-called "Corporate Money" is emerging as the result of a complex web of business alliances. Among them, though small in scale, Kotoden and Iyotetsu present an interesting case. While Kotoden represents the one which follows the *de jure* standard, Iyotetsu follows a different standard. It has been believed that network externality will benefit the follower of the standard system; however, the era of Web2.0 may bring a different result. Since the operation had just started, results remain to be seen.

Another implication emerged from the analysis about the two corporation's core business. One of the strong assumptions about the advantage of having core business seems not to be critical in comparison to the role that unused prepaid value plays as regard to financial aspects. Further research is necessary to clarify to what extent the cash-flow from prepaid and unused value improves railway operators business.

Lastly, the technology – Felica – may have implications for developing new systems for cross border trading with the help of legislation of ERAR. Even though it is still limited to B2C and C2C transactions, now, smartcard payment will transform the shape of traditional means of B2B as well in the near future.

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Appendix I:
Chronology of Introduction of Smartcard by Region and Operators (adopted from Ministry of Land and Traffics Web) As of April 2006

Year	Tokyo Metropolitan Area		Kinki Area		Chukyo		Other Region		Public
	PASMO Pass Net Co.	Suica JR East 16.30 mil	ICOCA JR West 2.42 mil	Private / Public	Private / Public	Private / Public	Private / Public	Private / Public	
1999	-	-	-	-	-	-	-	-	-
2000	-	-	-	-	-	-	-	-	Experiment Monitoring (Sapporo)
2001	-	Capital Area	-	-	-	-	-	-	-
2002	-	Tokyo Monorail Rinkai	-	-	-	-	-	-	Saitama (Saitama) Tokyo (Tokyo)
2003	-	Sendai	Kinki	-	-	-	-	-	-
2004	Passnet-Bus IC Card Co.	-	Hanky/Keihan /Nose	-	-	-	-	-	Enshu (Shizuoka)
	IC Card Mutual Use Co.	e-Money	e-Money	-	-	-	-	-	Sapporo Experiment End
2005	-	Suica<->ICOCA	e-Money	-	-	-	-	-	Hokuriku (ICA) Takamatsu (IruCa) Kagoshima (RAPICA) Iyo (IC e-Card)
2006	-	Niigata Mobile Suica	ICOCA<->PITAPA	-	-	-	-	-	Fuji (PASSCA) Okayama (HARECA) Shizuoka (LULICA)
2007	23 large operators	-	Smart ICOCA	-	-	-	-	-	-
	PASMO<->Suica	-	Osaka City/ Kita-Osaka/ Hanshin/ Nankai/ Sanyo/ Kobe City	-	-	-	-	-	Shizuoka (PITaPa)
2008	-	-	Okayama Hiroshima Area	-	-	-	-	-	-
2009	-	-	-	-	-	-	-	-	Tosa Nagasaki
2010	-	-	-	-	-	-	-	-	Nishimhon
2011	-	-	-	-	-	-	-	-	JR Hokkaido
	-	-	-	-	-	-	-	-	Nagoya/ Nagoya City

Acknowledgements

This research is supported by:

- Matsuyama University Overseas Research Grant (2004 -2005)
- National Institute of Informatics (NII) Collaborative Research Grant (2006).

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