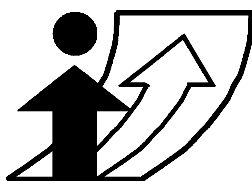# Connected Anytime: Telecommunications and Activity-Travel Behavior from Asian Perspectives

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Synthesis report
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Connected Anytime: Telecommunications and Activity-Travel Behavior from Asian Perspectives

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Abstract

In the past decade, our daily lives and activity-travel patterns have dramatically been changed by the prevalence of Information and Communications Technologies (ICT), such as the Internet and mobile phones. Virtual mobility and accessibility to cyberspace enable people to engage in a variety of activities, at anytime and anywhere. This report introduces the current situation of ICT and progress of research on telecommunications and travel in Asia, mainly in Japan. I discuss some research topics towards future travel behavior research.

Keywords

Social networks, Telecommunications, Mobile communications, Activity-travel pattern

Preferred Citation

1. Introduction

In the past decade, rapid development and diffusion of information and communications technologies (ICT), such as mobile phones and the Internet, have provided people with a lot of activity opportunities for communications in cyberspace. The use of ICT affects individual activity-travel behavior, and our lifestyles and activity-patterns have dramatically changed. In particular, mobile communications, which are not tied to a specific place or time, have made people's decisions about activity scheduling more flexible. Interactions between telecommunications and travel are considered to be classified into four types: substitution, complementarity, modification and neutrality (Salomon, 1985).

This ICT penetration can be considered one of the biggest changes in people's lifestyles since motorization. A lot of new concepts have been proposed to better understand human activity-travel behavior in this ICT era. One of the most important concepts could be *virtual mobility* and *virtual accessibility* (Golob, 2001; Kenyon *et al*., 2002). As Golob (2001) suggested, the three space-time constraints proposed by Hägerstrand (1970), the capability constraint, the coupling constraint and the authority constraint, can be adapted to the modern world of ICT. Automobiles have enhanced physical accessibility, whereas ICT have enhanced virtual accessibility. Travel is considered a demand, derived from participating in activities in the real space. Likewise, telecommunications is also considered a demand, derived from participating in activities in cyberspace. To better understand human travel behavior in this ICT era, we have to explicitly consider relationships between activities, travel and telecommunications.

On the other hand, some researchers argue the positive utility of traveling itself (Mokhtarian, P. and I. Salomon, 2001; Redmond, L. and P. Mokhtarian, 2001). They discuss three elements of travel utility: the activities conducted at the destination, activities that can be conducted while traveling and the activity of traveling itself. Of these, the second element will probably become greater due to increasing opportunities for conducting activities in cyberspace by ICT while traveling. Not only mobile phones equipped with a variety of functions but also miniaturized digital devices, such as portable computers and music players, contribute to providing activity opportunities in real space while traveling.

This report introduces the current situation of ICT and social networks in Japan and Asian countries, and briefly reviews progress of research on travel and telecommunications in Japan. I discuss some research topics towards future travel behavior research. Social networks and telecommunications research also relates to "group behavior". In another workshop in this IATBR conference, Fujiwara and Zhang (2006) reviews research progress of group behavior analysis in Japan.

2. Social Networks and Telecommunications in Japan and Asian Countries

In Japan, the number of Internet users is 79 million and its penetration rate to the population is 62% at the end of 2004 (Ministry of Internal Affairs and Communications, Japan, 2005). The other Asian countries of relatively higher penetration rates of the Internet in 2004 are South

Korea (66%), Hong Kong (50%), Taiwan (54%) and Singapore (56%) (see International Telecommunications Union). The number of subscriptions to mobile phones is 95 million (including 4.6 million Personal Handy-phone System (PHS) subscription) and its penetration rate to the population is 74% at the end of 2005. The penetration rates of mobile phones in other Asian countries in 2005 are 79% in South Korea, 123% in Hong Kong, 97% in Taiwan and 101% in Singapore (see International Telecommunications Union). Japan has also been by far the largest provider of Internet connection services via mobile phones. About 87% of the total number of subscribers to mobile phones are mobile Internet subscribers (including *i-mode*, *EZweb* and *Vodafone Live!* services), which is fairly high in comparison with other major countries and regions. Now the Japanese government promotes "ubiquitous" networks that are characterized by the realization of easy "person-to-person" plus "person-to-goods" and "goods-to-goods" communications (Ministry of Internal Affairs and Communications, Japan, 2005).

2.1. Telecommunications in Japan

This section reviews a short history of mobile communications in Japan from pagers to mobile phones, and introduces social networks in cyberspace. Modes and services of mobile communications have rapidly changed especially in this decade. A pager service started in 1968 and spread in the second half of the 1980s. When people call the number of a pager, the pager vibrates or rings the bell. It also can send a series of numerical figures from the telephone to the pager. It became explosively widespread in the mid 1990s, especially among high-school girls. They sent a message as a series of numbers like a corded message, for example, "0906," which is pronounced in Japanese "O-KU-RE-RU," means "I will be late", and "14106," which is pronounced "A-I-SHI-TE-RU," means "I love you". Later, people became to be able to send messages in Japanese characters to the pagers. In 1996, the number of subscriptions to pagers was highest, about 10 million. On the other hand, cellular phone services started in 1987 and PHS in 1995. They have rapidly diffused until now. PHS is regarded a simple and low-cost mobile phone system and was spread especially among young people in the late 1990s. PHS has spread also in other Asian countries such as China, Taiwan, Thailand and Vietnam. Today 95% of mobile phone users use the cellular phone (popularly called "KEITAI" in Japan).

More and more functions other than voice call and e-mails have been equipped with mobile phones, such as camera, application software (e.g. games), 2D bar-cord reader, video player, music player, video phone, GPS, navigation, PC website viewer, TV receiver, electronic wallet, FM radio receiver, etc. Recently, "E-moji" that represents a variety of feelings by a variety of face symbols and "Gyaru-moji" that is a kind of play or diversion can be sent by mobile phones. They are popularly used especially among young girls. One of the characteristics is that teens have created new trend and culture of the use of mobile phones.

At present, three carriers, "*NTT DoCoMo*", "*KDDI*" and "*Vodafone*" provide mobile phone services in Japan. Another new three carriers will start to provide mobile phone services this year. The "number portability" system, which has already introduced in other countries, will be introduced also this year. Mobile phone users can continue to use the same phone number, if they change mobile phone carriers. This is expected to stimulate more competition among mobile phone carriers.

As for the Internet, social networks created by bulletin board system (BBS), Weblog (Blog) and social networking services (SNS) play an important role. "2 channel" is the most famous BBS in Japan. In the past several years, Blog and SNS have rapidly been popular also in Japan. Blog is regarded private diaries open to the public, whereas participating in a SNS group needs an invitation from a member. There are more than 50 Blog services and more than 20 SNS services in Japan. In March 2006, the numbers of Blog and SNS users are 8.68 million and 7.16 million, respectively (Ministry of Internal Affairs and Communications, Japan, 2006). In September 2005, the numbers of them were 4.73 million and 3.99 million, respectively. The number of users has been rapidly increasing. "Mixi" is the most popular SNS in Japan and it has more than 5 million people as members.

2.2. Characteristics of the Use of Telecommunications in Japan

In this section, I briefly discuss some important characteristics of the use of telecommunications in Japan. The first one is Japanese characters. In the countries where people use only one type of character, such as the Roman alphabet, it will be easy to write sentences on mobile phones. However, in the countries, for example Japan, where people use more than one type of characters, they have to change a type of characters into others. Basically, Japanese characters consist of 5 vowels and 10 consonants. For example, usually in Japan, when inputting words and sentences on mobile phones for writing e-mails, we change "Hiragana" characters into "Katakana" or "Kanji" characters by pushing a translation button several times. Usually mobile phones in Japan have a function of learning words used frequently by an individual user. For example, when a character is input, candidates for words appear based on the learning function and one of them can be selected. It saves time required for inputting sentences. In Korean mobile phones, people input a character by combining two or three parts of vowels and consonants. Different original inputting methods are developed and used in other Asian countries. This difference of how to input messages might affect the time required for inputting the same amount of information between countries. In other words, it might affect a level of virtual mobility.

The use of mobile phones is restricted by space-time and authority constraints, only within "digital boxes" (Dijst, 2004). Using mobile phones (both voice call and e-mails) while driving vehicles and motorcycles has been prohibited by the Japanese law since November 2004. A study reported that, from an observation survey, about 5% of drivers were using mobile phones while driving before the enforcement (Yamada *et al*., 2004). Talking with mobile phones inside public transport is basically prohibited. Other authority constraints restrict the use of mobile phones, for example, in a hospital, airplane, priority zone inside train cars, etc. However, compared with other countries, more people engage in some activities using a variety of functions of the mobile phones while traveling in Japan. A marketing company conducted a survey for *NTT DoCoMo* mobile phone users in October 2005, asking what activities they are doing while traveling by train (see *IT media* news). It shows many people use mobile phones in a train. Main activities were sleeping (66.2%), surfing *i-mode* sites (59.5%), seeing advertisements (58.4%) and e-mailing by mobile phones (51.9%) for males, and sleeping (71.3%), e-mailing by mobile phones (70.3%), talking with accompanied persons (67.2%), seeing advertisements (64.2%) and surfing *i-mode* sites (58.1%) for females. People use mobile phones not only inside the train but also while waiting for a train or bus at stations. The most dominant purpose of telecommunications by mobile phones is "making an appointment and communications for meeting with people" (Institute of Socio-Information

and Communication Studies, The University of Tokyo, 2001). Meeting appointment and waiting behavior have also dramatically changed (Ohmori *et al*., 2006).

Another major characteristic is the prevalence of mobile phones equipped with a GPS. Positioning technologies installed in mobile phones are used for convenience, safety and security matters. For convenience, mobile phones with a GPS can provide route navigation systems for persons and information on shops around the person. For safety and security, mobile phones with GPS prevent kids from crime and helps searching for elderly people with dementia symptoms. GPS mobile phones can be used for activity-travel diary surveys (Itsubo and Hato, 2006; Ohmori *et al*., 2006b).

2.3. Comparisons with Other Asian Countries

In this section, I discuss past research in the literature that compared Japan and other Asian countries. Yoshii (2005) compared the use of mobile phones and their social impacts among Japan, South Korea and Taiwan. In Japan, mobile phones are used for communications with close friends. In particular, mobile e-mails are used more frequently than voice calls. One of the reasons is that Japanese people tend to consider the partners' current situation and refrain from interrupting their activities even if they are very close friends, which is characteristic of the Japanese culture. On the other hand, in South Korea, voice calls are dominant use of mobile phones among members of a group of family and close friends, called "Oori" (sometimes translated "We-ness") (Kim, 2006). In the South Korean culture, there should not be reserve among people at anytime. This promotes voice calls rather than e-mails. There is also a difference in using mobile phones in public space. Japanese people care about the eyes of the public very much. However, South Korean people take into account the minimum consideration for the relative strangers called "Nam". South Korean people consider that replying e-mails as soon as possible is etiquette when receiving e-mails from friends. In Taiwan, mobile e-mails and mobile Internet are rarely used. One of the reasons is that the number of characters used in daily life is very large and inputting sentences needs much effort. Another reason is that frequent voice call is allowed in Taiwanese culture. Compared with Japan, since family has a more important position, voice communications by mobile phones among family members are frequently conducted. The use of mobile phones strengthens connection and relationships of members in social networks, of daily and close friends in Japan, "Oori" in Korea and family in Taiwan.

Oya and Kondo (2005) compared the use of mobile phones of university students between Japan and China. In China, mobile phones are very expensive commodities. For getting mobile phones, it costs as much as the first monthly salary that Chinese people get soon after graduating from universities. In China, people can use only Short Message Service (SMS) between mobile phones (no e-mails to any e-mail addresses). SMS is used more frequently than voice calls. However, the frequency of sending SMS in China is less than that of mobile e-mails in Japan. The main purposes of using SMS are chatting and meeting appointment, which is similar to Japan. On the other hand, the main purposes of voice calls are urgent business and meeting appointment in China, which is similar to Japan. SMS and voice calls are differently used depending on the communications purposes. People can also use graphical characters in SMS in China. They also use abbreviated sentences for the purpose of saving the number of characters, for example, "U," which means "you", "IC," which means "I see", and "39," which means "thank you".

3. Progress of Research on Social Networks and Telecommunications in Japan

3.1. Transportation and Travel Behavior Research

The Eastern Asia Society for Transportation Studies (EASTS) is an academic institute in Asia established in 1994. A conference is held every two years and a lot of researchers in Asia participate in the conference and exchange information. In Japan, there are some academic institutes associated with transportation planning and travel behavior research, such as the Infrastructure Planning Committee in Japan Society of Civil Engineers (JSCE), Japan Society of Traffic Engineers (JSTE), the City Planning Institute of Japan (CPIJ), International Association of Traffic and Safety Sciences (IATSS), etc. In this section, I briefly introduce the progress of research on telecommunications and travel in Japan.

In Japan, since more than 20 years ago, interactions between telecommunications and travel have been discussed. IATSS 633 Project Team (1982) investigated the relationships between substitution and complementarity function of traffic and communications, which is one of the earliest research projects in Japan. The project conducted a questionnaire survey and investigated the possibility of substitution and complementarity function for business activities.

Telecommuting and teleworking, which can substitute commute travel, have been expected to solve urban problems. In the 1980s, the Japanese government powerfully promoted teleworking. However, after the collapse of the "bubble economy", teleworking was not introduced in earnest. About 10% of workers do teleworking (more than 8 hours per week) in 2005 (Ministry of Land, Infrastructure and Transport, 2006). A lot of research on impacts of telecommuting and teleworking on workers and urban systems have been conducted. Mitomo and Jitsuzumi (1999) estimated the impact of telecommuting on mass transit congestion in Tokyo. Sato and Ota (2000) showed that the prevalence of telecommuting promoted suburbanization and mitigated congestion in city centers from the analysis using urban economics models. On the other hand, since Japan has rapidly been facing the aged society (19.5% of the population are 65 years and over in 2005 census), keeping the work force is one of the important policy issues. From this view, teleworking, without long commute, provides the elderly and handicapped persons with working opportunities. Kanbara and Mihoshi (1999) examined the possibilities of handicapped persons' teleworking. In 1999, an academic institute of Japan Telework Society (J@TS) was established and has promoted research on telework.

Communication media choice of office workers has been researched. Takita *et al*. (1995) found that the different type of information to convey affected communication media choice; face-to-face contacts, telephone, FAX, TV conference system, etc. Doi *et al*. (1998) conducted a diary survey of business communications for office workers and found that the time required for meeting and travel time affected choice between face-to-face contacts and telecommunications. Baba (1998) conducted an office communications survey and revealed the existence of substitutive effects among different telecommunications devices. Baba (2000) investigated relationships between face-to-face contacts and accompanied communications. He found that e-mails were mostly used for sending documents in advance the face-to-face meeting. Arai and Nakamura (1996) examined spatial information flows for business

activities using the contact analysis method. When the Internet and e-mails were gradually spread among office workers, possibilities of substitution of these new media were research interest also in Japan. As for the analysis in national level, Tsukai and Okumura (1999) investigated relationships inter-prefectural business trips and telephone call flows by developing gravity models, considering cross price elasticity between the two modes. Taniguchi *et al*. (2000) investigated how the distribution patterns of urban activities have changed, to evaluate regional equalization by improvement of transportation and communications infrastructure.

One of the impacts of the Internet and mobile phones on daily lives is consumer behavior. However, research on the effects of ICT on consumer behavior and shopping travel does not seem to have made much progress in transportation research field in Japan. Taniguchi *et al*. (2003) observed shopping behavior in real space and cyberspace, and found both substitution and complementarity effects between them. Oya (2003) revealed that some people became to spend more money for communications by mobile phones and less money for other commodities after starting to use mobile phones. Oya (2006) discusses that consumer behavior for amusement, recreational and entertainment activities not only in daytime but also in night time has changed.

Especially for these five years, some researchers have been much interested in research on the impact of the Internet and mobile phones on travel behavior from activity-based approach (e.g., Ohmori *et al*., 2001; Nishii *et al*., 2003, 2005; Senbil and Kitamura, 2003a, 2003b, 2003c). Some research investigated the effects of the use of telecommunications on activity scheduling and travel behavior using information from activity and telecommunications diary surveys. Nishii *et al*. (2004) analyzed the effects of telecommunications on joint activities within household members. Sasaki *et al*. (2003) analyzed complicated relationships between activities, travel and telecommunications by applying data mining methods. Niwa and Ohmori (2003) and Ohmori (2005) observed young couples' communications behavior. Ohmori *et al*. (2006) investigated the meeting appointment and waiting behavior of young people with mobile communications.

New concepts and frameworks, to better understand relationships between activities, travel and telecommunications, have been proposed. Kondo (2003) proposed a concept of three "Tsu": "Koutsu," which means "travel" or "transportation", "Ryutsu," which means "distribution," and "Tsushin," which means "telecommunications". He suggested that the "mobile market" consists of the three "Tsu" infrastructures that connect any two regions. Nishii (2006a, 2006b) proposes a new framework of "transportation and communications systems analysis" that extends Manheim's transportation systems analysis to include ICT system. He also argues the importance of interdisciplinary approach with geography, consumer behavior and urban sociology to better understand the impact of mobile communications on our lifestyles.

3.2. Other Important Progress

Two large-scale national time use surveys have been conducted in Japan. Since 1960, NHK Broadcasting Culture Research Institute (1996, 2002) has conducted a national time use survey every 5 years, where the numbers of sample are 10 to 100 thousands people all over Japan. In the year 2000 survey, "the Internet" and "e-mail" was newly added to the category

of activities. Since 1976, Survey on Time Use and Leisure Activities has been conducted for more than 200 thousands people every 5 years by Statistics Bureau in Ministry of Internal Affairs and Communications. In the year 2001 survey, "the Internet use" and "e-mail" were explicitly added to the survey category. These are very useful time series data to know the impacts of ICT on our daily time use.

In the field of sociology, social impacts of ICT are main research concerns. Institute of Socio-Information and Communication Studies, The University of Tokyo (2001) conducted diary-type information use surveys for more than 2,000 people in Japan. The research group conducted the survey in 1995, 2000 and 2005. The book published in 2001 contains the current situation of the use of ICT, comparison between 1995 and 2000, and specific topics such as digital divide, information literacy, simultaneous activities, communications habit, etc. In the book, Hashimoto (2001) discusses digital divide. He argues that activity opportunities provided by the Internet helps the elderly, handicapped persons, people living suburban areas and child-rearing women. However, they use the Internet less. Digital divide is enhancing inequality and social exclusion problems. Suzuki (2001) argued the difficulty of measuring information literacy and discussed the gap of the information literacy. From the international comparative analysis, he found that the similar trend existed that male and younger people had high literacy and educational background affected the literacy in Japan, US, Italy, etc. Nakamura (2001) investigated mobile e-mail communications and discussed that full-time intimate community was strengthened by mobile e-mails rather than mobile voice-calls. The result in the 2005 survey is to be published. Their research interests are mainly in social impacts and psychological aspects. Then they do not seem to explicitly consider concrete geographical locations where activities and communications are engaged in urban space. However, their research gives transportation researchers very fruitful information for better understanding human communications behavior.

The Advanced Institute of Wearable Environmental Information Networks (WIN) established in 2000 has promoted research on wearable computers. One of the attempts is the development of services of "Wearable Information Networks" to wirelessly monitor plants, animals, humans and artifacts on which the miniaturized terminals are attached. Through the fusion between micro-machine, micro-sensor, and network technologies, they aim to positively contribute to the development of human health and wealth, as well as the reservation of the natural environment. The wearable computers can provide people with much more activity opportunities at anytime and anywhere.

4. Discussion about Future Research

Lastly, I would like to discuss some research topics for future travel behavior from Asian perspectives. As described in the previous section, the disutility of traveling could be reduced by the increasing activity opportunities while traveling by ICT. Activity alternatives while traveling depend on different travel modes. There is a possibility that public transport becomes more attractive mode than driving a car, if travelers can engage in activities more comfortably not only during in-vehicle time but also during waiting and transferring time. Recently, especially in Tokyo, more people tend to prefer to live in the downtown areas near their working places. On the other hand, some people enjoy long commuting by high-grade trains, engaging in a variety of activities while traveling. Activity diary surveys could be extended to include activities while traveling. There is another possibility of directly

observing activities while traveling in a train and bus (Sakuma *et al*., 2005).

It is important to explicitly consider "digital divide". As described before, people with lower physical mobility tend to have lower virtual mobility, because most of them are the elderly people without car availability or living suburban areas where the level of service of both public transport and telecommunications infrastructures is relatively low. This could promote social exclusion problems. Recently, for example, air ticket booked via the Internet is cheaper than conventional booking methods, people who have no Internet access have disadvantages. In some cases, people with some characteristics can not communicate with each other and can not be a member of a social network. For example, a blind person cannot communicate with a deaf person without a help of a person who can use sign languages. New applications and terminologies regarding ICT appear one after another. ICT users have to understand what the new applications are and how they work. Most of the new words used in ICT and major language used in the websites over the world are English. This could cause lower levels of accessibility to activity opportunities in cyberspace for Asian people. As Kenyon (2002) suggests, virtual mobility should contribute to solve social exclusion problems. It is important to provide every people with opportunities for participating in activities both in real space and cyber space equally.

As described in this report, also in Japan, ICT have had a big impact on human daily lives and activity-travel patterns, and research on telecommunications and travel has made a progress. ICT will continue to change social networks and human communications behavior. As a result, human activity-travel behaviour will also continue to change. I believe that research on social networks and telecommunications is one of the most important and interesting topics in travel behavior research. I hope that more transportation researchers have interest in this theme.

Acknowledgement

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