Analysis of experience with formalizing handicapped parking system

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\textbf{Abstract}

Saga is the first region in Japan to introduce a formalized handicapped parking permit system (known as the PP system), an identification card system, in order to protect accessibility privileges designed for disabled individuals. This paper describes the analysis methodology that relied on a graphical representation to quantify type of occupants and dwell times of usage of handicap parking spaces.

The effectiveness of the PP system and its attributes has been analyzed using two different surveys in this research project. The first investigation was an observational survey that focused on quantifying changes in usage patterns including potential illegal use. The investigation indicates that there is an increase of the usage level of parking space allocated following the implementation of new system as it accompanied a broadening of the definition of eligibility. At certain sites, the allocated handicapped parking spaces were occupied for nearly 60% of the time causing unacceptable level of inconvenience for disabled. The second investigation applied a questionnaire survey to examine perception of users of parking facilities. Results of this survey are consistent with findings of the other survey. Although the introduction of permit system and broadening of the definition of disabilities were done with best intentions, the new system has reduced the availability of parking spaces to wheelchair users.

1. Introduction

The Japanese government legislation has been mainly silent on policing aspects of handicapped parking although it has specified the minimum standards to be maintained by owners of traffic generators. There are three relevant specifications that have legal status in Japan: (i) the width of handicapped parking spaces should be at least 3.5 m (Kubota, 2008); (ii) handicapped parking space should be provided as close as possible to entrances of demand centers such as shopping malls (Cabinet of Japan Government, 1994); and (iii) the minimum required number of handicapped parking spaces is 2\% of the number of total parking spaces when that total available space is equal to or less than 200, or 1\% of the total parking spaces plus two when the 200 spaces threshold is exceeded (Ministry of Construction of Japan, 1994). The regulation framework in Japan is limited and simple compared to overseas examples such as the Americans with Disabilities Act (ADA). ADA stipulations are relatively more detailed, accordingly, the parking space marker color has to be blue and width 60-inch-wide.
(1.52 m) in access aisles in order for them to be wider than the allowance made for regular spaces. The specifications also state that penalty signs usage should be at least 5–7 feet (1.67–2.13 m) above ground level (Department of Justice in U.S., 2010). Furthermore, the required number of handicapped parking spaces in general parking lots has been specified in ADA (Anonymous, 1992) Other publications describe facility design specifications including permit requirements for handicapped parking systems in the European Union, United Kingdom, South Korea, and Singapore (Nishidate, Mizuno, & Tokuda, 2008a; SG Enable, 2010).

Although such reserved parking is important because many disabled people depend on private vehicle for transportation, some able-bodied people misuse handicapped parking spaces, resulting in inconvenience and disappointment for genuine disabled people who rely on availability of these spaces. In an effort to reduce the illegal use of parking spaces reserved for people with disabilities, international researchers have investigated effects of signage (Cope & Allred, 1990), printed messages (The Chronicle of Higher Education, 1981), fines (Fletcher, 1995), policing and enforcement on rate of violations (Fletcher, 1996).

The Japanese experience in this field contrasts in two different ways. Firstly, Japan did not have a formalized permit system prior to 2006 when Saga region in the west of the country introduced such a system. The second difference is the lack of punitive measures for illegal users of handicapped parking. In Japan, regulators are reluctant to criminalize petty offences and have not formed a legal framework to deal with handicapped parking lot usage by able-bodied individuals. Adopting a concept from social cognitive theory (Bandura, 1986), the local government of Saga did design a framework based on self-compliance to reduce the abuse of handicapped parking. This paper sets out to investigate the effectiveness and level of acceptance of the parking permit system introduced in Saga. Two field surveys were carried out, one for a quantitative analysis of usage levels and the other for a qualitative analysis of user experience. A brief explanation of the parking permit system implemented is included below before the introduction of surveys.

2. Literature review

On July 29, 2006, Saga prefecture introduced the first formal identification card system (a parking permit system known as the PP system) for disabled users of vehicles to permit such users to occupy handicapped parking spaces. This system classified disabilities according to the length of validity into two categories while broadening the definition of 'disabled person' to include non-visible disabilities, intellectual disabilities and temporary impairments. The color of the permit conveyed the length of validity although many locals have come to associate the color with the severity of disability. In addition, pregnant women, the elderly and those having mild trouble with walking are allowed to apply for parking permits as well (Public Health and Welfare Office in Tosu, 2009).

The regional government approached owners of shopping malls and hotels and reached an agreement on the operation of handicapped parking spaces that would be provided by operators within their premises. Such an agreement was necessary because the regional government does not have the legal authority to make unilateral decisions related to private properties. Then, the regional government explained to residents the reasons for not introducing punitive measures to protect individuals with disability. The main reasons were: an appreciation of resistance of the general public to a penalty system; difficulty to implement the penalty system only in one region instead of whole Japan; and the high cost of implementing a penalty system (Saga Government, 2011). Authors believe other reasons were also present, such as: the objections from shopping mall and hotel owners who do not want to offend or discourage the able-bodied customers with a penalty system that maybe perceived as an additional access cost; and a possible deterioration of community harmony as a result of conflicts between drivers who are fined and vigilant neighbors. For these reasons, the handicapped parking proceeded in a gentle way to prevent the able-bodied parking. Although above community consultation measures were carried out, there was no predictive analysis or investigation for handicapped parking spaces in Saga prior to implementation of the PP system (Kiyota, Hayashida, & Maeda, 2009a).

The health and welfare division of Saga (Saga Universal Design Laboratory, 2013a) provides the complete list of disabilities acceptable for use of handicapped parking. The list of accepted disabilities goes beyond the traditional visible impairments. The list includes impairments such as deafness, vision problems and vocal disorders. Heart problems, neurological ailments and HIV (human immunodeficiency virus) infections are also specifically mentioned. Intellectual disabilities are also included in the list. Temporary impairments are also covered bringing pregnancy and sporting injuries into the definition of disabled for the purpose of eligibility for a parking permit.

Traditionally, the disabled people in Japan used to leave a government document in the form of a booklet to indicate that they are in receipt of some kind of disability benefit. This was a voluntary arrangement and relied on definitions of other agencies.

The disabled individual needs to mail an application with relevant information to receive a permit. The application form has to be supported by a medical practitioner who can detail the relevant symptoms and assessments (Saga Universal Design Laboratory, 2013b).

However, when it comes to handicapped parking systems and parking permits (tags or placards) overseas, there are some differences between Japan and other countries. The parking permit in America is quite easy to identify for its bright color. Fig. 1a shows the handicapped parking permits in Florida State (My-DMV, 2008). The red tag is a temporary permit. The permanent or long-term handicapped parking permit (the blue tag shown in Fig. 1a) must be signed by the applicant and a
physician, podiatric physician, optometrist, advanced registered nurse practitioner, or physician assistant. Different from Japan, it is the mobility impaired persons that are eligible for handicapped parking permits in the USA although there are ongoing discussions about extending the facility to pregnant women in some jurisdictions. When a violation of handicapped parking is detected, violators incur penalties in the range of US$ 100–500. There is no uniformity of these rules among different states.

The European Union has also adopted handicapped parking permit system with strict punishment regimes for illegal use by able-bodied drivers. Violators pay a minimum of € 80 (about US$ 110) in fines for using a handicapped parking space. Moreover, pregnant women, elderly and those having mild trouble with walking are generally ineligible for permits. An example of a European Union parking permit is shown in Fig. 1b. The information for the individuals with disabilities along with the severity of the disabilities is recorded on back of the permits (Nishidate, Mizuno, & Tokuda, 2008b).

The handicapped parking permit is often referred to as a ‘badge’ in documentations in United Kingdom, and although there are local differences, badge holders can park for up to 3 h in areas marked by single or double yellow lines and without a time limit restriction in areas controlled by parking meters and pay and display machines. (Nishidate, Mizuno, & Tokuda, 2008c) These badges are available to those who are legally blind, receive above a specified level of the mobility component of Disability Living Allowance, or receive a War Pensioner’s Mobility Supplement (Allied Mobility, 2011). These eligibility criteria are conceptually similar to those later adopted in Japan, where certain types of social welfare receivers are treated as disabled individuals. In addition, the maximum of penalty in UK is about £ 1000 (US$ 1500). An example of the permit is shown in Fig. 1c. As in other industrialized countries, information about the individual with disability is recorded on the permit.

In South Korea, the parking permit system is somewhat similar to Japan. Pregnant women, the elderly and those having mild difficulties with walking are allowed to park their vehicles in handicapped parking lots according to regulations. However, there is a difference: in South Korea a strict penalty system is applied for violations. Violators are fined about ₩ 100,000 (about US$ 90). A lesser fine (between US$ 9 and US$ 27) is incurred for illegal bicycle parking. Furthermore, an extremely punitive treatment is applied for fake permits. The fine is more than 10 times the fine for illegal use of a handicapped parking space. Fig. 1d shows the example of a handicapped parking permit from South Korea (Able-News in South Korea, 2012).

In Singapore, the organization of Centre for Enabled Living (CEL) makes disability care program accessible by centralizing referrals and matching the specific needs of individuals to the appropriate services. CEL manages a system known as the Car Park Label Scheme for persons with physical disabilities. This system does not cover pregnant women and the elderly. Moreover, Class 1 Label (example shown in Fig. 1e) is only issued to disabled drivers. Car Park Label Scheme is strictly policed. Violators incur a minimum fine of SGD$ 50 (about US$ 40).

In Japan, there are two types of parking permits. Saga prefecture pioneered the styles of permits. The green color permits for long-term disabilities have a validity period of 5 years and cover wheelchair users, those with a terminal illness or a cognitive impairment. On the other hand, pregnant women and people having short-term problems with walking receive an orange color permit with a validity period of 1 year. The focus of the two-color classification introduced is the long-term short-term nature of the mobility difficulty although there is a widespread belief in the community that the classification is related to the severity of the disability, as mentioned earlier. Unlike other countries, the information about the disabled person is not recorded on the permit, thus the method has no control over fake tags or behavior of borrowing the permits.
to abuse the accessibility privilege. In addition, there are no regulations requiring individuals with disabilities to display the permits when they park at handicapped parking spaces. Fig. 1f shows examples of the two types of permits issued by the health and welfare division of Saga (Saga Universal Design Laboratory, 2013c).

Compared to overseas parking permit systems, there are two noticeable differences between Japan and most other countries. Firstly, the Japanese government carries out the handicapped parking permit with no punishment for improper use by able-bodied drivers. Secondly, the government expanded the scope of application, by including pregnant women, the elderly and those having mild difficulties with walking. These two factors may degrade the parking availability for the severely disabled motorists.

The acceptance of more categories of disabilities in the introduced formal system has increased the potential user population while the number of handicapped parking spaces has remained unchanged. Thus the obvious starting point for the work presented here (Study 1) was to investigate the impact of the new system on new usage levels of handicapped spaces. Then, a questionnaire survey (Study 2) was administered to understand the user perception about their experience with handicapped parking facilities after the introduction of the PP system.

3. Study 1

3.1. Introduction of usage pattern of handicapped parking facilities survey

The first phase of the research work is based on an observation study within the parking structure of a popular shopping complex known as the “J” mall in Saga. This shopping mall is the first large private industry to support the PP system in Saga prefecture. The survey recorded the start and end times of the parking duration for three separate areas where handicapped parking has been provided. The field survey reported here was carried out in September 2008 for an 8-h duration from 10:00 am to 18:00 pm. This is part of a sequence of annual parking surveys carried out every September since 2006 when the PP system was introduced. The data collection has been carried out on a Sunday to enable comparison with previous data. The weather was relatively fine on the day of survey.

The distribution of the 11 handicapped parking spaces observed is shown in Fig. 2. The shopping center has 2000 regular parking spaces and therefore obliged to provide at least 22 spaces for handicapped parking. The center has exceeded this requirement and has 27 such spaces. The 11 spaces selected for the observation study are the ones near shop entrances and the ones in demand according to a reconnaissance visit to the mall.

Handicapped parking lot A on the first floor is the nearest as well as the most convenient one in relation to the mall entrance. The number of parking spaces in the lot B is smaller, but it is also close to an entrance to the mall. Handicapped parking lot C is somewhat distant from entrances and is on the third floor. This is the least convenient parking area among the three areas considered. This area is less illuminated and has a high concentration of vehicle fumes. Though less

Fig. 2. Schematic layout diagram of the handicapped parking survey sites.
convenient, the possibility of finding empty parking spaces and the proportion of severely disabled people using it is relatively high with this parking lot.

Two trained observers were allocated to each set of adjoining parking spaces shown in Fig. 2 (in total 8 observers). Observers were positioned away from the parking lot in an unobtrusive manner to avoid influencing the parking behavior of vehicle owners during the survey period. They recorded information on paper about the apparent severity of disability of drivers and passengers, time of alighting from vehicle, time of departure of the vehicle and the type of parking permits or other proof displayed. For coding purpose, four numerals were adopted to classify users. Individuals with a severe visible disability, wheelchair users and those using crutches were recorded as code 1. Pregnant women, elderly and persons showing mild difficulty were assigned code 2. Persons who appeared to be able-bodied but displayed a parking permit were indicated by code 3. Persons who appeared to be able-bodied and did not display a parking permit were recorded as code 4. The possibility that able-bodied person has borrowed a permit from other individuals with disabilities is high because information about disabilities is not recorded on the permit. Code 3 could be such a situation. In addition, disabled people are not legally required to display permits as mentioned in section 2. Therefore, code 4 category, who are seemingly able-bodied and did not display a parking permit, can sometimes have a genuine reason such as temporary or non-visible difficulties (such as a chronic back pain or asthma). Henceforth, persons indicated by codes 3 and 4 are called 'seemingly able-bodied'. It is acknowledged that codes 3 and 4 individuals are not suitable for classification purely based on observations.

3.2. Analysis method

Fig. 3 indicates occupancy periods of handicapped parking spaces in the three handicapped parking lots. The horizontal axis stands for the 11 handicapped parking spaces and the vertical axis indicates 10-min increments from 10 am to 18 pm. It shows handicapped parking occupancy when one parking spot is occupied for more than five minutes (i.e., 50% of the period of cell length). Although the cell length of 5-min would be more accurate, it was not included here to save space. It has been verified that there is only a small difference between results computed for 5-min increments and 10-min increments of time intervals.

The code for person characteristic of the handicapped car space users are shown as a number code in Fig. 3. The code appearance is highlighted using a half tone shading scheme. The coding system is as follows: Code 1: severely disabled people, such as drivers and passengers who are wheelchair users; Code 2: mild disability including elderly and pregnant women; Code 3: persons who appeared to be able-bodied but displayed the parking permit; Code 4: persons who appeared to be able-bodied and who do not display any documented evidence. The figures with circle mean the user of the space changed during that cell period to a new user of the same type. In the example presented, there are two such occurrences in relation to bay 7, once at 1 pm and the next such event at 2 pm. It is now possible to estimate when the handicapped parking lot became full and the percentage of time when the parking lot was full.

3.3. The effectiveness of the PP system

Fig. 3 shows that from 10:30 am, over 75% of the lot A was occupied (in other words, 4 out of 5 spaces were taken). It was completely full from 11 am with some spaces becoming available at times. Handicapped lot B became full at 11:15 am and Handicapped lot C was full from 1:40 to 2:15 pm and then from 3 to 4 pm.

During periods of full occupancy of the parking lot, some cars occupying the lot belonged to mildly disabled individuals. It can be also seen that there are potential abuses of this facility by able-bodied individuals during those periods when all spaces are occupied. Cells with light shades indicating user types 3 and 4 show possible violation events by seemingly able-bodied individuals. However, it is acknowledged that we cannot be certain that the person is a violator simply based on visual observation.

Further analysis has shown that parking lot A was full for 125 min out of 480 min (26.0% of the observation period). In other words, a disabled person may not have a space available in the lot A to park for about 0.25 of the time period. Handicapped parking lot B was full for 300 min indicating 0.6 probability of not being able to find parking there for disabled persons. In contrast, parking lot C was full only for 25 min indicating availability of a vacant space during most of the day. The number of disabled people using the parking lot C was small, probably because it was less convenient in relation to the Mall entrance. It is logical to anticipate the disabled driver is not willing to choose handicapped facilities which are distant from the building entrance and have an unpleasant parking environment.

There is a contribution by vehicle users of mild disabilities also to the non-availability of parking for those with severe disabilities. In the absence of an able-bodied vehicle user occupying the space, the parking lot A was still full, for 37 min, with some space taken by mildly disabled persons. However, as a percentage of the total observation period this is a low 7.8%. Although use of the facility by mildly disabled people has denied availability for a person with severe disability, this is not yet a serious problem in lot A. In lot B, the corresponding time period when mildly disabled users were causing potential overflow without any possible violations by seemingly able-bodied users of vehicles was 267 min. This is about 55.6% of the observation period and there is some cause for concern here, unlike in lot A.

Fig. 4 shows the comparison of quantities of the four categories of users as a percentage of the total number of users of handicapped parking spaces soon after the PP system was introduced (Kiyota, Hayashida, & Maeda, 2009b) and two years
following the implementation of the system at the shopping mall. The data collection was similar to the method described in the previous section. The four categories of users correspond to the four types identified at the end of Section 3.1. Sample sizes were 45 and 50 respectively in the two surveys. The impact of acceptance of a wide range of mild disabilities to the scheme is reflected by the growth of the middle category in the Figure. Over the 1 year 9 month period, the proportion of vehicle users with mild disabilities making use of the handicapped parking facilities has grown from about 45% (n = 20) to 60% (n = 30).

The introduction of the PP system may have contributed to the small reduction in percentage of seemingly able-bodied users of handicapped spaces. Nevertheless, about quarter of users of handicapped spaces are seemingly able-bodied (Code 3 and Code 4) even after two years from the introduction of the PP system.

The increase in users with mild disabilities has also caused the percentage of users with severe disabilities to show a reduction to 14% (n = 7) from the previous 24% (n = 11). It appears that the acceptance of a broad range of mild disabilities into the official system had a measureable and larger impact on users with severe disabilities than on users with a mild disability.

\begin{table}
\centering
\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline
\textbf{Parking lots} & \multicolumn{10}{|c|}{\textbf{PP (Parking Lots)}} \\
\hline
\textbf{Time} & \textbf{A} & \textbf{B} & \textbf{C} & \textbf{D} & \textbf{E} & \textbf{F} & \textbf{G} & \textbf{H} & \textbf{I} & \textbf{J} \\
\hline
\textbf{Hour} & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 & 11 & 12 & 13 & 14 & 15 & 16 & 17 \\
\hline
10 & 0 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
11 & 0 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
12 & 0 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
13 & 0 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
14 & 0 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
15 & 0 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
16 & 0 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
17 & 0 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 & 2 \\
\hline
\end{tabular}
\caption{Usage periods of handicapped parking spaces.}
\end{table}
Fig. 5 shows the comparison of percentage of handicapped parking space occupancy times associated with the four categories of vehicle users. The pattern of this graphical representation is consistent with the pattern already seen in Fig. 4. The total occupancy times are 3153 and 3476 min respectively, 3 months after and 2 years after the PP system was introduced. However, it is misleading to compare the occupancy times between the two surveys because the five handicapped parking spaces from 15:30 to 16:30 pm were not available for use due to a sewage problem in the first investigation (Kiyota, Hayashida, & Maeda, 2009c). Therefore, the level of change is displayed by comparing the ratios of occupancy time. According to this analysis, the total occupancy time by mildly disabled users has grown from about two-fifth to two-third of the occupancy time by all users, during the space of a 21-month period. The total occupancy time by those having severe disabilities has seen a large reduction in Fig. 5, indicating a cause for concern.

Inspection of Figs. 4 and 5 shows an undesirable outcome for severely disabled people who rely on handicapped spaces. Anyhow, the above figures also indicate a positive outcome from the formalized system of permits in the form of some reduction in abuse of the handicapped parking space by seemingly able-bodied individuals for an unfair gain. This outcome is consistent with concepts put forward by social scientists such as Tittle (1977) about the potential to use the fear of societal censure to modify personal behavior. The expectation in the context of handicapped parking is that the fear of disrespect from the society can dissuade able-bodied from being recognized as a person using a resource allocated for disabled individuals.

4. Study 2

The next stage of this project involved a survey of user perceptions to understand feelings about the usefulness of the PP system from the viewpoint of honest users of handicapped spaces. For this purpose, a short questionnaire was prepared and delivered to individuals with visually identifiable disabilities. There were three questions related to the analysis presented here in this survey. These questions focused on: (i) The type of mobility aid used by the respondent – examples: wheelchair, crutches; (ii) General availability of handicapped parking when the respondent arrives at the mall; and (iii) Perception of level of benefit provided by introduction of the PP system.

Eighty questionnaire forms were placed in mailboxes of potential subjects seen to be either wheelchair users or walking with the aid of crutches. The survey sample was selected from members of the Saga branch of an association for patients
with spinal injuries. This organization had previously supported another survey related to handicapped parking and user perceptions as described by Kiyota, Hayashida, and Maeda (2011). 49 completed questionnaires were returned (i.e. response rate of 61%). Simple analysis of the first question above showed that 70% of respondents were drivers who are wheelchair users. The remaining 30% needed crutches or similar implements to assist steadiness in standing and walking.

The second question about availability of parking was posed with a structure for an answer according to the degree of difficulty. There were three options of answers to the question about respondent experience about the availability of handicapped spaces when he or she arrived at the shopping mall: (i) “Nearly always” (ii) “Some of the time”, or (iii) “Almost never”. These responses corresponded to the status of the car park being viewed as (i) rarely full (ii) sometimes full or (iii) often full, respectively. Fig. 6 shows the distribution of responses for this question which indicates that about 45% of respondents view the car park as ‘rarely full’. On the other hand, the remaining 55% has a less than positive experience about the space availability for handicapped. Although these values do not match exactly with the physical observations reported earlier, the experience of disabled motorists from a qualitative sense is not much different from what has been presented in the earlier analysis with the aid of Fig. 3.

The third question revealed the perception about the level of improvement provided by introduction of the PP system. What is important to the driver in this situation is the ease of finding an appropriate parking space as already considered in the previous question. There were four possible answers to select from: (i) became worse; (ii) felt no change; (iii) became somewhat better; and (iv) became much better. Fig. 7 presents the breakdown of responses separately for drivers who are wheelchair users and motorists who use other aids. Adding the last two response options in the figure shows that about 40% of drivers who are wheelchair users felt the parking system became relatively easy after the implementation of the PP system. About 20% of wheelchair users thought there was no change. It is noteworthy that about 40% of this type of disabled respondents believed it had become worse after the introduction of the PP system. However, only 18% of drivers who use other mobility aids believed the parking system became worse. This category of disabled persons are much satisfied with the introduction of the PP system as can be seen by adding the last two response categories which shows that about 73% of such respondents have stated that the PP system has resulted in an improvement. This high level of satisfaction by drivers who are crutch users and low satisfaction of drivers who are wheelchair users provide an insight to the thinking pattern of these two types of disabled individuals. Indeed the wheelchair users are now inconvenienced as the population eligible to

![Fig. 6. Perception about the likelihood of handicapped lot being full when drivers arrive at the parking facility.](image)

![Fig. 7. Percentage breakdown of driver perception about the degree of improvement since introduction of the PP system.](image)
use handicapped parking has been enlarged with the acceptance of a broader definition of the term ‘disability’. On the other hand, other disabled persons of less severe mobility difficulties may not have even considered using handicapped spaces marked with the international sign depicting a wheel chair, before the introduction of the PP system. For such mildly disabled individuals, the PP system has given the official consent to use the wide parking spaces. This indicates a positive outcome to these individuals. For them, the handicapped lot being full is not a great inconvenience as they can still park on a regular space without much difficulty.

5. Conclusions and suggestions

An investigation of the success of the introduction of a formal handicapped parking permit system, locally known as the PP system, has been based on two field surveys that uncovered some problems caused by the new arrangements. The paper has briefly explained the system introduced and a comparison with handicapped parking permit system examples from other countries has been documented.

The initial observation survey and the analysis method followed have provided a picture of the usage pattern of handi-capped parking lots in the survey area. In particular, it has been possible to quantify the times and durations when handicap-parked lot is full and thereby identify when it causes inconvenience to those with severe disabilities.

The second survey about user perception of the PP system has indicated that, in general, those with less severe disabilities have benefited from formalization of the exclusive arrangement whereas wheelchair users have become losers as they are now forced to compete with the less disabled drivers for the wide parking space needed to transfer between the wheelchair and car. The quantitative and qualitative analyses performed in this project have converged to same conclusions that drivers with severe disabilities have been the main losers from the manner of introduction of the permit system.

The problems with the system introduced stem from the widening of the disability definitions without a corresponding increase in the number of parking spaces dedicated to disabled groups. This indicates a need for addition of handicapped parking spaces to compensate for allowing mild disability groups, pregnant women and people with disabilities not physical in nature. There is strong evidence to suggest that it is worth reviewing the outdated specification for number of handicap-capped parking spaces in supermarket facilities.

Acknowledgements

The authors would like to thank the Mr. Itsuki Maruta, the general manager of the ‘J’ Mall, Saga, for his support and consent for the field surveys and the Foundation for Promoting Personal Mobility and Ecological Transportation for their information and support.

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