STUDY OF SIGN SYSTEM IMPROVEMENT IN A HISTORICAL PARK BASED ON BEFORE AND AFTER COMPARISONS

Hiroshi Tsukaguchi[1], Upali Vandebona[2], Hayato Mukai[1]

[1]Ritsumeikan University, Kusatsu, 525-8577, Shiga, Japan

[2]The University of New South Wales, Sydney, 2052, NSW, Australia

Email for correspondence: tsukaguc@se.ritsumei.ac.jp

ABSTRACT

Visitors to tourist areas including historical precincts rely on the on-site direction sign system as the primary aid for self navigation. The paper documents the methodology adopted to estimate the effectiveness of modifications made to the sign system in a popular historical ground, known as Nara Park, in Japan. This park attracts about 13 million visitors a year. A development project for modification of the sign system was carried out leading up to 2010 as part of preparation for the 13th Centenary celebrations, considered one of the most significant historical milestones for the nation and an opportunity to showcase this heritage area. The study was designed as a before and after analysis to identify lessons for transport planning and management purposes. The study team had to account for number of jurisdictional issues and simultaneously account for different level of guidance information required by first timers as well as repeat visitors. There was an opportunity to apply the transition matrix concepts to model route patterns of tourists. The field surveys have shown that modifications to the sign system have resulted in a quantitatifiable increase of the sight-seeing experience for visitors while enhancing the level of satisfaction with navigation aids.

Keywords: Sign system, Tourist behaviour, Historical park, Before and after comparison

INTRODUCTION

Problem definition

Way finding and route guidance methods within popular tourist zones need periodic review to ensure they meet requirements of visitors as well as various operators related to the tourism activity. In Japan where this project was conducted, pedestrian direction signs at tourist zones have traditionally received negative

comments from social media sites as well as certain travel guide literature. Terms such as garish are liberally used in internet sites to describe feelings toward such signs. Often these signs consists of a number of direction arrow boards mounted on a single post, haphazard in the manner boards are attached to the post. Although the information given may be correct, the presentation is comical and these signs often require a full circle walk around the post to review the information. This rustic appearance may have been appropriate in the past, but lacks the symmetry and professionalism of signs public have become used to in general traffic streams. It is generally agreed that many historical zones in the region need improvements to sign systems. The research problem covered in this paper is about methods available to quantify outcomes from a sign improvements scheme.

A before and after analysis method has been adopted here as it allows review of tangible benefits as well as change of perceptions and satisfaction. This method involves conducting field surveys at different points in time using identical survey instruments. In the project reported here, it has been possible to identify a higher level of satisfaction with the sign system from the opinion survey conducted after the system modification. It is also observed that the amount of attractions visited per visitor has increased following the modification.

There is little in terms of recent literature that specifically relate to this topic area. Recent efforts of researchers in this area have been devoted to improvement of signs on escape routes related to Tsunami and natural disasters, for example as reported by Chanson (2010). A tourism oriented sign improvement project has been reported by Osaka City Government (2003). That work has investigated problems of the old system for visitors and has set out to develop a visitor-friendly environment. Colour coding signs was the theme of the short article by Misty (2002), reporting an improvement scheme carried out in a popular holiday destination in the USA.

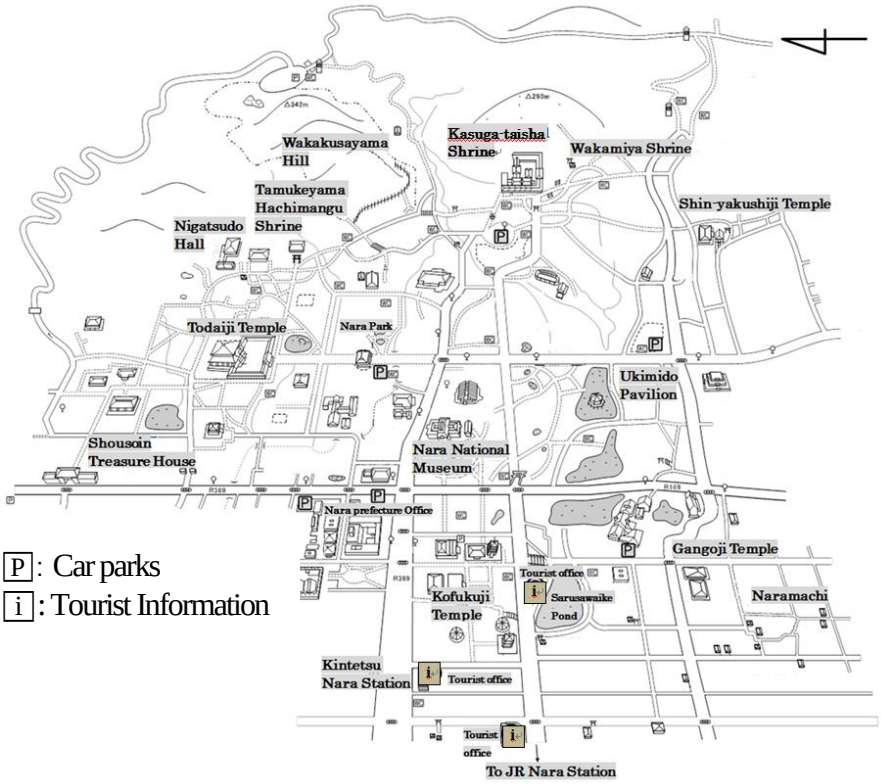
Case Study – Nara Park

The sign improvement project and surveys reported here were carried out at Nara Park situated at the former capital of Japan. This site which attracts about 13 million tourists per year is famous for its mix of heritage sites and harmony with the surrounding wooded area. Visiting this site is of great cultural importance to Japanese of all ages, from school children to elderly.

Nara Park was established in 1880 as an urban park managed by Nara Local Government, generally referred to as Nara Prefecture. There are several world heritage sites in this area including Todaiji temple, Kofukuji temple, Kasuga-taisha shrine, and Gankoji temple. In addition to those sites of religious significance, the park contains a museum, administrative offices and tourist information centres , as shown in Figure 1.

Capital of the ancient Japan was established at Nara in the year 710. As year 2010 was the 1300 anniversary since the establishment of the former capital, series of spectacular events were planned to commemorate the centenary. As a result, lot more visitors were expected during that period to come from all parts of Japan and beyond. This prompted the Nara local government to embark on a project to upgrade the sign system to a simplified and readily understandable system for both first timers as well as repeat visitors.

There is a difference between the administrative definition and what is considered by the public as Nara Park. Administratively, Nara Park is the area managed by Nara Prefecture and this area does not include separately owned religious properties such as Todaiji Temple, Kofukuji Temple and Hasuga-taisha Shrine. Nevertheless, the general public consider those sites also as part of the Nara Park (see Figure 1). The area considered by this study has its boundary consistent with this public perception. Therein lies an administration issue faced by this study team. The researchers had to be mindful of sensitivities of different landlords and negotiate with multiple owners to perform the necessary field work, particularly when gaining permission to do surveys at different locations at what is considered as one park.



Figurer 1 - Locality map of the study area

Signs in tourist areas need to be informative and helpful to visitors who may have little familiarity with the site as they come from distant parts within and outside the host country. Signs located between where tourists begin and end their sightseeing need to provide continuity and consistency. Also, sign system should provide complete coverage and do not miss any major attractions in the tourist zone. A potential problem is that too many signs along with oversupply of information can overwhelm and confuse visitors. Some signs installed in the past in this park were deficient due to lack of uniformity and clarity of explanations partly because different owners were engaged in installation of signs with little coordination and overall guidance.

METHODOLOGY

Data collection

The physical installation of modified signs began in the financial year 2009 and was to be completed in the next financial year. Therefore, the pre-installation survey was conducted in mid 2008. The after installation

survey was planned for end of 2010. However, budget delays at the prefecture disrupted the installation timeline and the installation work did not complete till the second half of 2011. The survey team carried out the end of 2010 survey as planned, but it was estimated that only about 30% of signs were completed by that time. Therefore a third round of survey was carried out at the end of 2011 to capture the actual after conditions. Essentially, the three rounds of surveys provide an insight to the before conditions in 2008, during transition conditions at the end of 2010 and after conditions at the end of 2011 as shown by the first two columns of Table 1.

The surveys were based on a questionnaire seeking information about the on-site travel behaviour in terms of the number of sites visited and routes followed by visitors. The questionnaire also contained questions to measure the perceived level of satisfaction of visitors about the prevailing sign system. The questionnaires were distributed at eight locations in total, at transport interchanges, a busy road link and major attractions within the park for respondents to complete and return by post. The first survey in 2008 achieved only about 10% response rate and it was hypothesised this low response rate could be due to a perception bias of the public against the research credentials of public servants who distributed the questionnaires. The second and third surveys employed university students with the questionnaires presented as part of a university research project. As shown in Table 1, that change of questionnaire distribution method has been productive and the response rate has improved to above 30%.

Table 1 - Summary of questionnaire distribution and response rate

Survey date	Progress of sign improvement	Number of questionnaires distributed	Number of questionnaires returned	Response rate
July, 2008	0 %	10020	1075	10.7 %
December, 2010	30 %	932	298	32.0 %
November, 2011	100 %	2000	711	35.5 %

The gender breakdown and age distribution of respondents in each survey are shown in Table 2 and Table 3 respectively. It is observed there is an increase of the female response rate in the second and third surveys. Age distribution of respondents appears to fluctuate from survey to survey without a particular pattern emerging.

As mentioned earlier there were two main areas addressed by the questionnaire. The first part related to travel paths followed by the visitors sought information related to where the starting and end points of their journey within the park, the sequence of the attractions visited, routes selected and locations where they may have experienced difficulties due to inadequacies of direction aids. The second area of focus was the level of satisfaction including usefulness and ease of understanding of the signs the visitors encountered. There were 25 questions altogether, divided into seven groups.

Table 2 - Gender distribution of respondents in different surveys

	Year of survey		
Gender	2008	2010	2011
Male	529 (49.2 %)	109 (36.6 %)	245 (34.9 %)
Female	546 (50.8 %)	188 (63.1 %)	404 (57.5 %)
Total	1075 (100.0 %)	298 (100.0 %)	702 (100.0%)

Table 3 - Age distribution of respondents in different surveys

Age group	Year of survey		
	2008	2010	2011
Below 20	23 (2.1%)	6 (2.0%)	9 (1.3%)
20-30	65 (6.0%)	33 (11.1%)	41 (5.8%)
30-40	163 (15.2%)	59 (19.9%)	91 (13.0%)
40-50	210 (19.5%)	44 (14.8%)	101 (14.4%)
50-60	301 (28.0%)	61 20.5%)	188 (26.8%)
60-70	239 (22.2%)	72 (24.2%)	181 (25.8%)
Above 70	74 (6.9%)	22 (7.4%)	90 (12.8%)
Total	1075 (100.0%)	297 (100.0%)	702 (100.0%)

Classification of visitors

The design phase of the sign system considered the familiarity of visitors with the park. For this purpose, tourists were classified into two categories according to the number of times they have visited this tourist zone. The two categories were named newcomers and repeat visitors. Conceptually, a newcomer is a tourist who visits this area for the first time. However, that particular definition was disregarded in this project because majority of Japanese schools have excursions to this important historical area. The project team decided to discount that first trip made during a person's school days which may have been insufficient to provide sufficient familiarity to consider the next trip as a true repeat visit. Thus, for the purpose of this project, a newcomer is a person visiting for the first or second time to this park. These visitors are considered unfamiliar with the orientation and layout of the park whereas repeat visitors are considered to have some familiarity. A repeat visitor is a person who has made at least two previous visits to Nara Park.

The design of the system focussed on providing plain and simple direction signs for the newcomers and concentrated on leading these visitors to the primary attractions. In other words newcomers are directed toward those locations considered must-see sites.

Providing an enhanced experience for repeat visitors was achieved through installation of descriptive signs with directions provided to experience additional elements of the park. Conceptually, this is akin to guiding the visitors who have some previous experience to other hidden treasures of the park. Invariably, somewhat verbose and schematic signs are required to satisfy the repeat visitors.

The proportion of visitors in these two categories changed from survey to survey. The proportion of repeat visitors in the 2008 survey was 81.6%, in the 2010 survey it was somewhat low at 67.4% and in the 2011 survey it was back to the previous range and was 82.5%. The simple conclusion is that repeat visitors form about three quarters of all the visitors to the site. This observation highlights the popularity of Nara Park as a leading tourist destination in Japan.

Analysis Method

A statistical analysis of questionnaire survey responses was performed to identify differences and trends of on-site travel properties over the three time periods. The emphasis of this analysis component has been to identify the influence of information offered by the sign system on the sequence of sites visited and route choice behaviour of visitors.

The data was first checked for any seasonal bias as the survey in 2008 was carried out in summer and the surveys in 2010 and 2011 were carried out in late autumn in Japan. In order to make the before and after comparison meaningful, it was decided to estimate the difference of circulation time available for tourists in summer and late autumn. Figure 2 shows the distribution of start and end times of sightseeing of respondents in 2008 and 2011 surveys. Frequency of start times is plotted upwards and frequency of end times is plotted downwards in the diagram. Majority of the entries to the park happens in the morning over a four hour period and most of the exits occur in the afternoon over a six hour period. The graphs are reasonably close to each other and do not indicate a reason to consider there are seasonal effects that need to be considered for the purpose of analysis of the travel behaviour of visitors to this park although the seasonal variation may have influenced other aspects of their day. The average duration of stay in Nara Park was identical at 5 hours in both surveys periods.

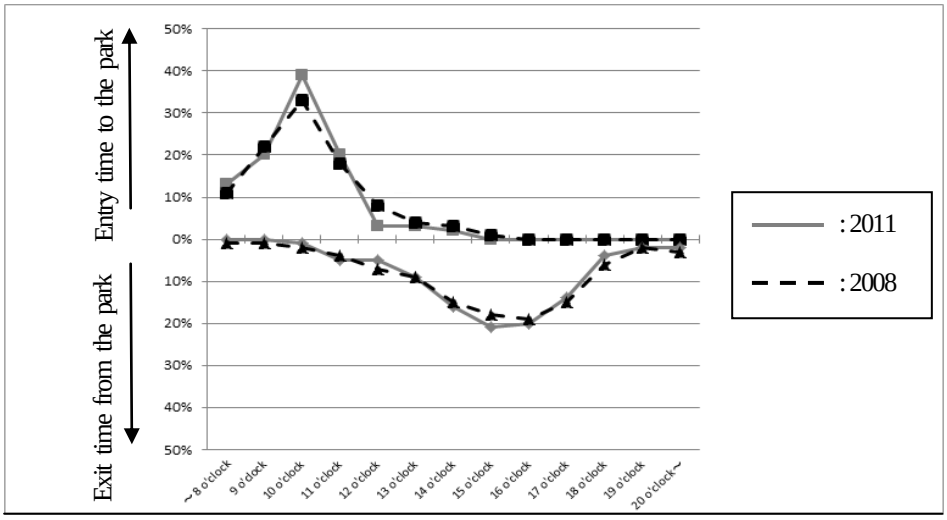


Figure 2 - Start and end times of respondents

SIGN SYSTEM DESIGN FOR THE TOURIST AREA

Identification of attractions to be included in the sign system

An important step during the planning stage of the sign system modification is the selection of attractions to be considered for the visitor guidance. This was achieved through a ranking process that relied on two interrelated selection criteria. How these rankings were then applied in the sign design will be explained in the next section. The present section is focussed on briefly explaining the process followed in ranking of attractions.

One criterion considered for ranking of attractions is the heritage importance and the other is the popularity. The significance to heritage is determined through inspection of the status of the attraction in the register of 'important cultural properties'. Some cultural properties enjoy an elevated status within the nation and were referred to as 'national treasures'. This classification was adopted as the basis of ranking attractions within the park according to the cultural significance. Among these, some attractions were open only at selected periods during the year and these were ranked below full time attractions for the purpose of this project. The

upper part of the Table 4 shows how heritage (criterion 1) was accounted for in determination of the ranking of attractions for the purpose of signage design.

The other criterion adopted is the popularity, which was measured from responses to the first questionnaire survey. The lower half of Table 4 refers to the classification of attractions according to the level of popularity (criterion 2). Another obvious consideration is whether the site has been mentioned in guide books, tourist information websites and other documentation accessible to general visitors. The first survey revealed that most newcomers visited four major attractions. They were placed as rank A attractions of the park. The four sites were Todaiji temple, Kofukuji temple, Kasuga-taisha shrine and Nara National Museum all of which enjoy the highest status according the significance to heritage criterion as well. A similar association was observed between the ranking according to the heritage and popularity, in the lesser ranked attractions as well, as seen in Table 4. There were four sites as named above classified as rank A attractions. There were 25 attractions classified as rank B, 19 attractions in rank C and 24 attractions in rank D at the conclusion of this classification process.

Table 4 - Ranking of attractions within the zone

Attribute		Rank A	Rank B	Rank C	Rank D
Heritage	National treasures - open for public all year around	✔	✔		
	National treasures - available only at selected periods			✔	
	Important cultural properties - open for public all year round			✔	
	Important cultural properties - available only at selected periods				✔
Popularity	Highest popularity in the first survey	✔			
	High popularity in the first survey		✔		
	Medium level popularity in the first survey			✔	
	Described in major guidebooks and tourist brochures	✔	✔	✔	✔

Relationship between the type of visitor and rank of attraction

It is now possible to conceptualise a relationship between the needs of the two types of visitors and the rank of attractions. As mentioned earlier, newcomers are more interested in 'must see' attractions and cannot afford the time to immerse themselves in lesser known sites. Therefore, the focus of contents of the modified signs primarily targeting newcomers has been to navigate these visitors among rank A attractions. Left side of Figure 3 is a schematic representation of this design concept. These signs are devoted to navigation among the four major attractions already mentioned and attempts to minimise the information load on newcomers.

Right side of Figure 3 shows the concept related to signs catering to repeat visitors. This is achieved by providing a supplementary sign system in addition to the sign system that focuses on navigation among the main attractions. The challenge now is to build on basic familiarity possessed by repeat visitors and give them opportunities to explore beyond the main attractions to better appreciate what is left of a historical capital. As mentioned earlier, this requires wordy sign boards and diagrams because these signs are not only navigation aids but also has to function as rudimentary educational tools. In essence these signs are expected to encourage widespread circulation and provide a sense of confidence to visitors that they are unlikely to get lost. Objective of this form of signs is to allow repeat visitors to venture outside the dense activity zones and experience lesser ranked attractions as shown in Figure 3.

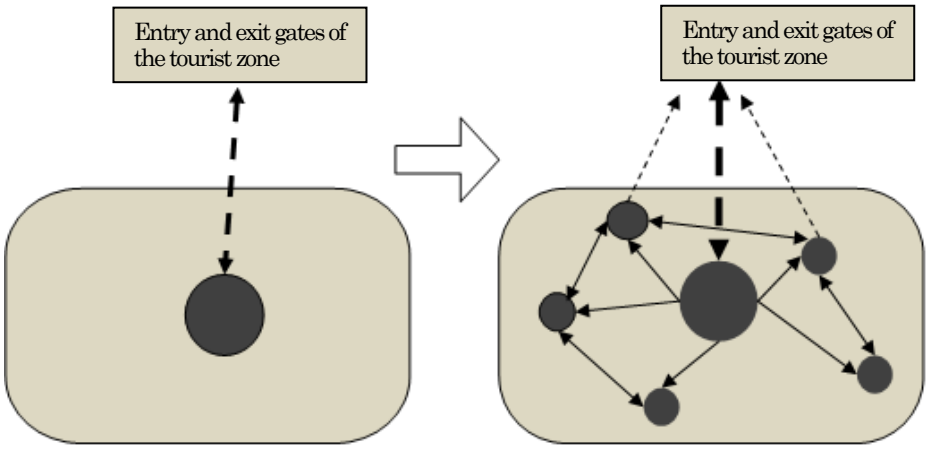


Figure 3 - Concept diagram of the design objective of the modified sign system

Design specifications

There are three types of signs in the modified sign system of the Nara Park. They are named arrow signs, map boards and explanatory signs. The arrow signs are the simplest category. They are mounted on posts and the destination boards are precisely aligned and spaced to each other to avoid the old style haphazard appearance. To further reduce the clutter, the maximum number of arrow boards mounted on a post is limited to 6. And the maximum number of destinations that can be indicated by one arrow was set to 2. Symmetry of signs is attempted where possible for aesthetic reasons. A consistent symbol system similar to computer icons is also included in the destination board to indicate the type of destinations (see Figure 4). As these signs are the primary aid for newcomers, the arrow signs are mounted above the eye level of pedestrians. The top cap of these sign posts has been designed as a cube that displays the icon for information on its four sides to make the position of the post visible from a distant for anyone who may become anxious about directions.

Map boards and explanatory signs are vertical display panels, usually below the eye line of the visitors (see Figure 4). An appropriate title is at the top frame of these displays. These information panels are mounted on two side posts and the posts are driven into a paved surface to complete the professional appearance of these signs. These subsidiary signs play an important role in stimulating visitors and enhancing their experience of the day. Map boards are helpful in providing orientation as well as the overall layout of sites whereas explanatory signs are helpful in providing a narrative and photographs to explain significant details related to this heritage site. Figure 4 shows examples of the three types of signs implemented. One picture shows that there are situations when different types of signs are thoughtfully placed in the close proximity.

Location of signs

Sign improvement project began in the financial year of 2009 (financial year begins in April in Japan) and has only partially completed by end of next financial year as mentioned in a previous section. This means that the first survey in July 2008 was carried out at least six months ahead of the commencement of improvement work at the site. Location of old style signs at that time is shown in Figure 5.

The third survey in 2011 was conducted after modification work has been completed. The location of signs, according to classification described in the previous section is shown in Figure 6. Obviously, arrow signs are

appropriate at intersections of walking paths. Arrow signs were introduced at dense traffic paths where earlier there were intersections without signs. Some of these locations are readily identifiable on Figure 6 on the two main routes between Kofukuji temple and Kasuga-taisha shrine.

Subsidiary signs can be on mid-blocks. In addition, these were spaced around to allow an overall coverage. In particular, number of new map boards was introduced spread over the tourist zone.

As mentioned earlier, religious properties are separate jurisdictions and signs on those properties cannot be interfered with by the park authorities. These separate administrative zones are indicated by dotted line boundaries shown in Figure 6. Therefore the sign improvement project team has decided to leave signs within those boundaries without change. In other words those areas have the old style signs at the same locations as in the first survey.

Map board by roadside

Arrow signs with distinctive icons

Explanatory board story book style

All three types could be combined as shown

Figure 4 - Examples of signs introduced during the modification

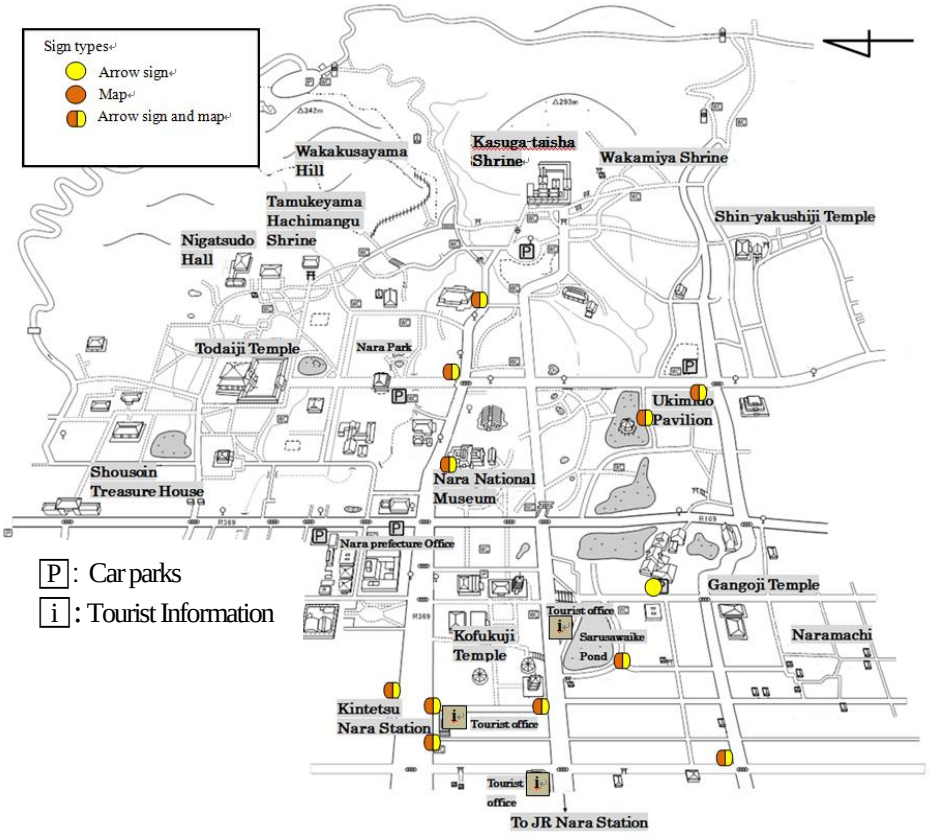


Figure 5 - Sign system in Nara Park when 2008 survey was conducted

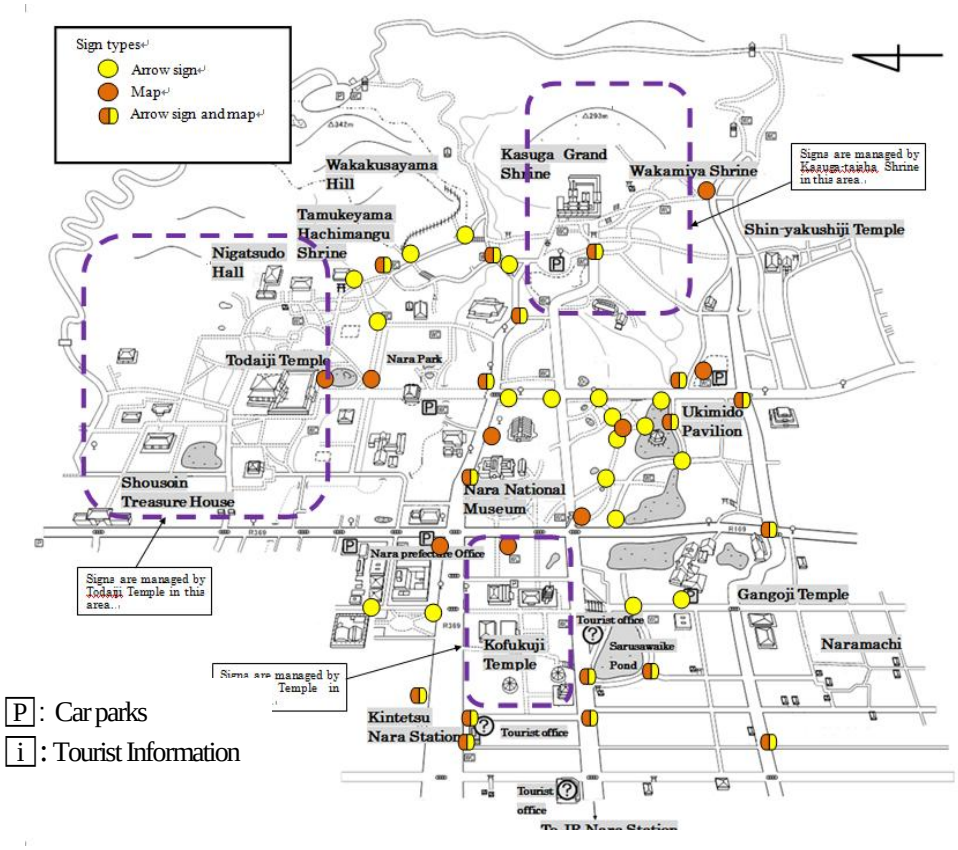


Figure 6 - Sign system in Nara Park when 2011 survey was conducted

EFFECTS OF SIGN SYSTEM IMPROVEMENT TO CIRCULATION BEHAVIOUR OF TOURISTS

Number of visits

Monitoring what happens to circulation patterns with the samples of introduction of new signs is important to the park administrators. Table 5 shows the frequency count of tourists visiting a given number of attractions. These allow computation of average count of attractions visited. Last rows of Table 5 provides these average values separately for newcomers and repeat visitors.

Table 5 - Average number of attractions visited

Number of attractions visited	Number of visitors (percentage)		
	2008	2010	2011
1	142 (13.20)	37 (12.50)	88 (12.50)
2	249 (23.20)	64 (21.50)	179 (25.50)
3	430 (40.00)	119 (40.10)	233 (33.20)
4	167 (15.50)	36 (12.10)	95 (13.50)
5	48 (4.50)	20 (6.70)	39 (5.60)
6	22 (2.00)	12 (4.00)	32 (4.60)
7	7 (0.70)	7 (2.40)	23 (3.30)
8	6 (0.60)	0 (0.0)	5 (0.70)
9	4 (0.40)	1 (0.30)	2 (0.30)
10	0 (0.0)	1 (0.30)	6 (0.90)
Total	1075 (100.0)	297 (100.0)	702 (100.0)
Average for repeat visitors	2.83	2.94	3.05
Average for newcomers	3.33	3.28	3.41
Average for all visitors	2.89	3.05	3.12

The results bewildered the survey team as it was expected that the repeat visitors would go to more attractions than newcomers who are not even familiar with the area. What the surveys revealed was the opposite, in all three surveys. The newcomers claimed to have visited more number of attractions than the average repeat visitor. This makes sense however, when we look at their travel paths. Repeat visitors get side tracked and meander to soak up the experience and invariably have to sacrifice the quantity of sites they can experience.

As shown in Table 5, the overall average number of attractions visited by a tourist to this area is 2.89 in 2008, 3.05 in 2010, and 3.12 in 2011. And the percentages of visits for more than 4 locations are 27.3% in 2008, 25.8% in 2010m, and 28.9% in 2011. It has been verified that the deference is significant between the average number of visits in 2008 and 2011 based on t-test at 1% significant level. However, the values are not significantly different in terms of statistical analysis between 2008 and 2010, and also in comparison of values between 2010 and 2011. Furthermore, t-test has shown that there is a statistically significant deference between 2008 and 2011 for repeat visitors. On the other hand, there is no significant deference between 2008 and 2011 values for newcomers at 1% significant level.

Transition matrix for circulation behaviour

Makov chain process is a useful mathematical tool to document the transition probabilities. In the context of this tourist zone, the circulation behaviour of individuals relate to walking from the origin transport terminal to a series of attractions in some sequence and terminating at the exit transport terminal. The transition matrix captures the movement probabilities from one attraction to any other attraction (or transport terminal).

To reduce the complexity of this analysis, the study area has been divided into five zones as shown in Table 6. The first column named 'zone' briefly describes the general area covered by each zone. Examples for key attractions in those zones are named in the second column. The origin and exit transportation terminals are listed as the first and last zones respectively. Zone 7 refers to areas not covered by any of the previous zones in the list.

The results of transition matrix are shown in Table 7. As shown in this table, the probabilities from zone 2 through 7 in which attractions are located, to the exit zone 8 is low in 2011 compared to those in 2008 except for the case of zone 2. This indicates that circulation level in 2011 is higher than that in 2008, which is consistent with the increase in average number of locations visited by respondents as described in the previous section.

Table 6 - Zones and included tourist attractions

Zone	Tourist attractions
1: Starting point	Entry transport interchange (not a tourist attraction)
2: Vicinity of Todaiji Temple	Todaiji Temple, Shousoin Treasure House
3: Vicinity of Wakakusa-yama Hill	Nigatsudo Hall, Tamuke-yama Hachimangu Shrine , Wakakusa-yama Hill
4: Vicinity of Kasug-taisha Shrine	Kasuga-taisha Shrine, Wakamiya Shrine, Shin-Yakushiji Temple
5: Center area	Nara National Museum, Ukimido Pavilion
6: Vicinity of Kofukuji temple and Nara-machi	Kofukuji Temple, Nara-machi, Gangoji Temple
7: Others	Remaining attractions not covered by zones 2 to 6.
8: Finishing point	Exit transport interchange (not a tourist attraction)

Table 7 - Transition probability values (upper matrix for 2008 and lower matrix for 2011)

	1	2	3	4	5	6	7	8
1	0.0	0.184	0.015	0.076	0.485	0.181	0.059	0
2	—	0.063	0.201	0.149	0.089	0.173	0.093	0.233
3	—	0.169	0.093	0.173	0.073	0.105	0.093	0.294
4	—	0.169	0.082	0.100	0.116	0.174	0.084	0.274
5	—	0.205	0.033	0.087	0.027	0.271	0.11	0.266
6	—	0.076	0.025	0.055	0.127	0.151	0.076	0.490
7	—	0.040	0.048	0.059	0.078	0.104	0.163	0.508
8	—	—	—	—	—	—	—	1.0

Table 7 *(cont.)* - Transition probability values (upper matrix for 2008 and lower matrix for 2011)

	1	2	3	4	5	6	7	8
1	0.0	0.228	0.02	0.054	0.439	0.185	0.074	0
2	—	0.110	0.196	0.075	0.069	0.159	0.104	0.287
3	—	0.122	0.211	0.178	0.052	0.103	0.146	0.188
4	—	0.176	0.075	0.112	0.096	0.139	0.139	0.262
5	—	0.364	0.018	0.046	0.009	0.198	0.109	0.255
6	—	0.133	0.008	0.032	0.088	0.179	0.094	0.466
7	—	0.129	0.065	0.039	0.068	0.197	0.146	0.356
8	—	—	—	—	—	—	—	1.0

EFFECTS OF SIGN SYSTEM ON PEDESTRIAN FLOW

Flow patterns before and after sign system improvement

The study team has been attempting to monitor and quantify changes to the magnitude of traffic as well as changes to the traffic pattern in this before and after study. As the study is based on a self-reported sample survey, it is not suitable to estimation of traffic flows. However, as mentioned in a previous section, it has been already established that tourists after the sign system improvement walk to more attractions than before. In other words, if we consider a given number of tourists, they now produce more circulation trips within this zone.

As the survey has specifically gathered information about the sequence of attractions visited and paths followed, it is possible to construct the overall flow pattern for the sample of respondents. Figures 7 and 8 refer to the flow pattern for before and after scenarios respectively. The diagrams present percentage of pedestrians using the links to remove the effects of differences of the sample size in the two surveys. Comparison of these figures shows only little difference in flow patterns. Ranking of links according to pedestrian flows would not have changed much because of the modification to the sign system. Two most popular route is the one that makes a right hand turn in the middle of the diagrams, this route begins at Kintetsu Nara railway station and goes to Todaiji Temple via Noborioji. This route is used by more than 50% of the respondents, in the both surveys considered here. The next popular route is used by about 40% of respondents in the surveys and this route goes toward east from the railway station along Sanjo Street to Kofukuji Temple or Kasuga-taisha Shrine.

What is interesting to park authorities is the detail of these flow patterns at the microscopic level. At that level, it is possible to identify noticeable changes. Now it can be shown that a large number of tourists have been able to find a shorter way between some locations after the modification of signs. The effectiveness of signs in this manner can be shown by an example related to the popular route mentioned above. Recall that this route had a sharp right turn when going from the Kintetsu Nara railway station to the Todaiji Temple. The number of tourists using a viable short-cut via points N, J and T as shown in Figure 9 has increased after the modification of sign system. This route goes through Yoshikien Garden and Isuien Garden allowing visitors to increase the count of attractions as well if they wish.

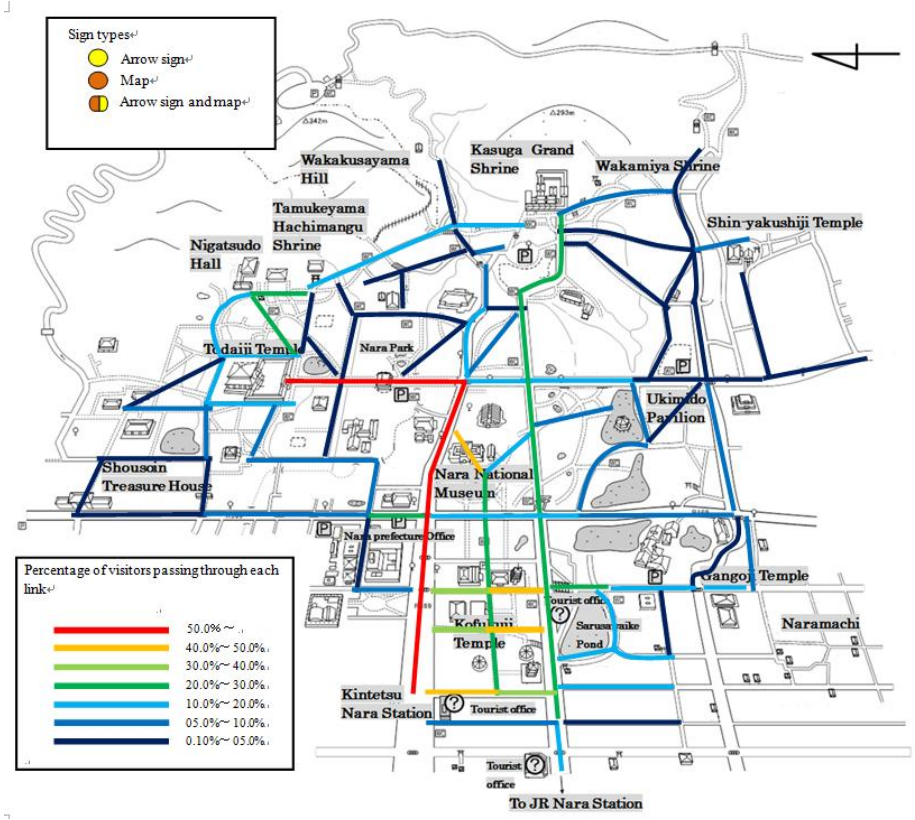


Figure 7- Observed pedestrian flow in 2008

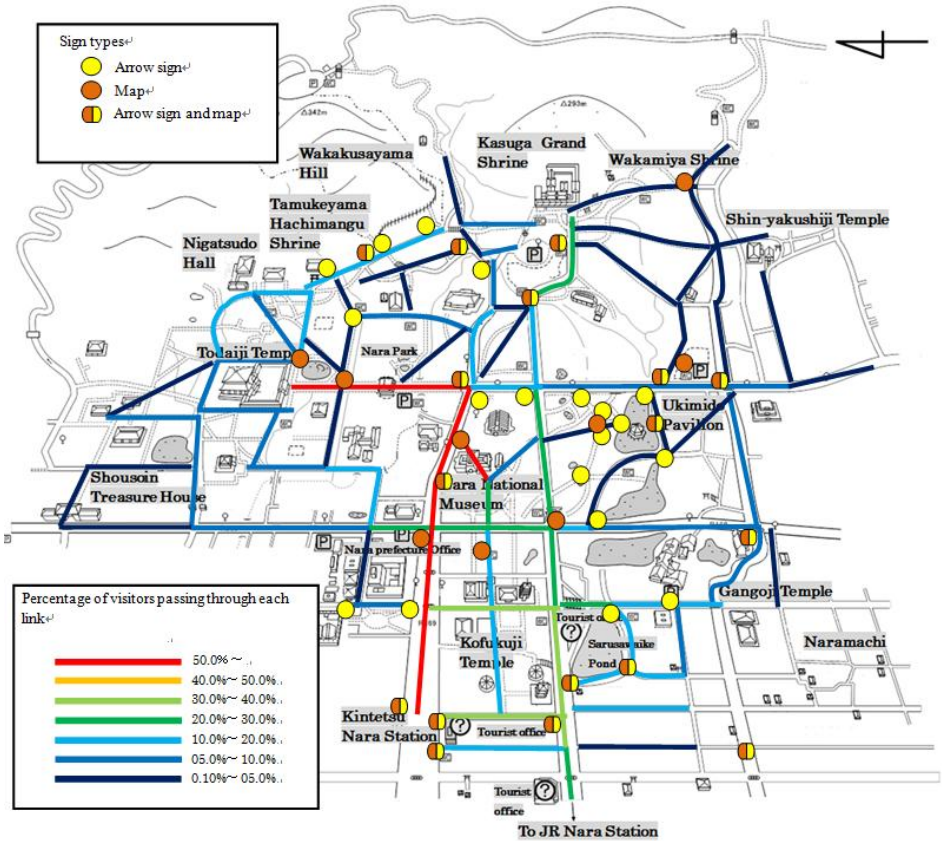
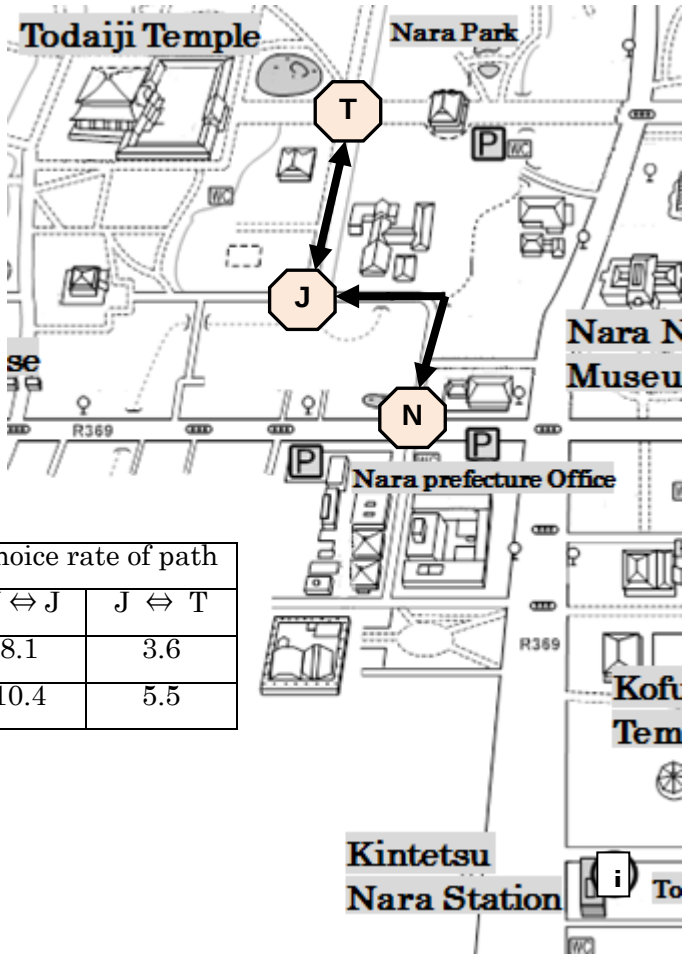


Figure 8 - Observed pedestrian flow in 2011



	Choice rate of path	
	N ⇔ J	J ⇔ T
2008	8.1	3.6
2011	10.4	5.5

Figure 9 - Change of flow on the alternative route to go from Kintetsu Nara railway station to the Todaiji Temple

At that level of detail of the flow pattern, positive outcomes in terms of walking distance reduction and increasing the potential count of attractions experienced by tourists can be attributed to the professional design of the sign system. There is another benefit from the traffic planning view point as some traffic has been diverted away from the congested route.

An unsolved problem

An obvious objective of the sign system improvement is reliable guidance so that tourists can reach their destinations. The survey included questions for respondents to reveal whether they got lost during the day. The initial survey was an eye opener for the study team as it showed about 10% of newcomers felt they have lost their way somewhere in the park. The following surveys were slightly modified to obtain more information about where respondents get lost to enable the study team to home in on the locality of the problem.

Table 8 shows percentages of tourists who lost their way according to the three surveys. The results are presented for newcomers and repeat visitors separately as there is a numerical difference in the experience for these two groups. In general, newcomers have tendency to get lost more than repeat visitors according to the data. Interestingly, for

newcomers, rate of losing their way steadily decreased from 2008 to 2011. Recall that the three surveys correspond to 0%, 30%, and 100% completion of the sign improvement. According to the first row of Table 8, newcomers position has improved quite well as the improvement project progressed. However, there is not much difference observed for repeat visitors, if any there was a slight increase in the rate of getting lost.

Table 8 - Percentage of visitors who lost their way

	Newcomers			Repeat visitors		
	2008	2010	2011	2008	2010	2011
Lost the way	10%	8%	5%	3%	4%	4%
Uncertain at times	22%	26%	29%	9%	17%	20%
Did not lose the way	68%	66%	65%	88%	79%	76%

However, if we combine percentages for the two severity levels of way finding problems (i.e.“Uncertain of directions at times” with “Lost the way”), the percentages are almost the same between 2008 and 2011 for the newcomers, and these percentages have decreased only slightly for the repeat visitors. These results seem to challenge the gains attributed to the sign improvement project in previous sections.

It is worth noting that average number of attractions visited increased in 2011. It may be argued that such an increase means that tourists are now wandering more and thereby put themselves in positions where they get lost.

The modification of the survey in 2010 to request information about where respondents got lost allows the development of an information black spot map as shown in Figures 10 and 11 which identifies paths where respondents claimed to have got lost, for 2010 and 2011 respectively. The percentage getting lost decreased from 2010 to 2011 around Nara National Museum, and the routes between Todaiji Temple and Tamuke-yama Hachimangu Shrine. On the other hand, along the route between Nigatsudo Hall and Todaiji Temple there is no reduction by 2011. Similarly properties such as Todaiji Temple, Kasuga-taisha Shrine, Ukimido Pavilion, and Nara-machi, the rate of getting lost has not decreased. A common feature of the areas where there is no reduction in getting lost or somewhat getting lost is that these areas are private properties that do not belong to the Park authorities. See Figure 6 for private property boundaries. As mentioned earlier these properties did not carry out sign improvements.

On the other hand, surrounding of Nara National Museum, and public paths connecting Todaiji Temple and Tamuke-yama Hachimangu Shrine are within the jurisdiction of the Park authority that has followed through with the sign improvement project, and these sections have seen positive outcomes in terms of less public getting lost on those sections now.

Although the evidence points toward positive benefits to the public from the improvement of sign system, the presence of pockets of private properties within the park has made it difficult to provide a blanket cover in terms of improved signs over this park. Some private properties have little in terms of signs and others have some old style signs. These

conditions are not helpful when the study team is aiming to minimize the number of tourists getting lost.

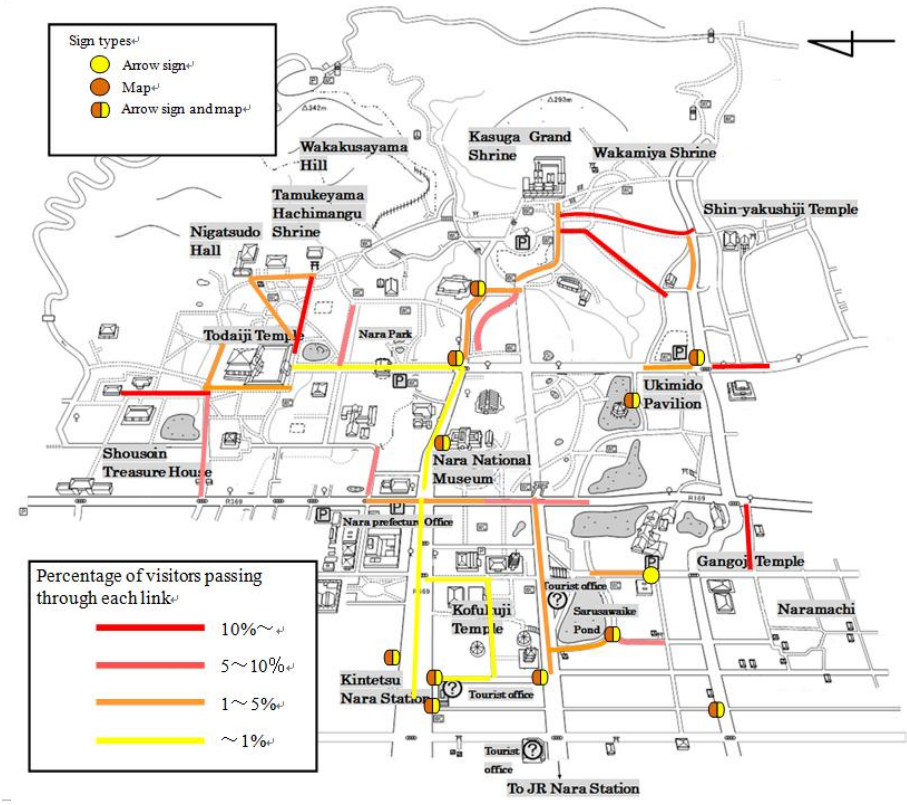


Figure 10 - Route segments where tourists lost their way in 2010

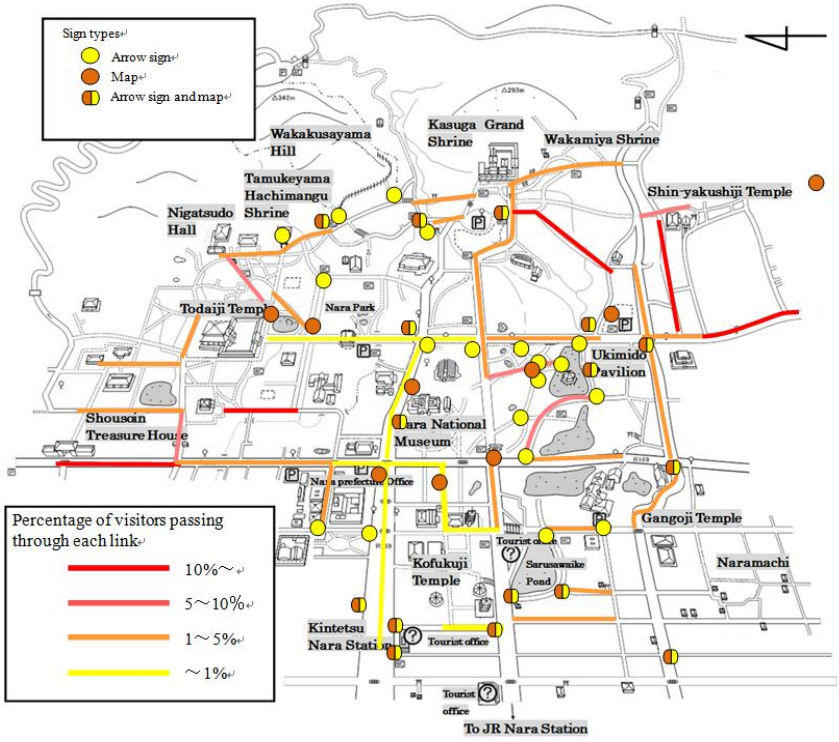


Figure 11- Route segments where tourists lost their way in 2011

CONCLUSIONS

This study evaluated outcomes to tourists visiting a popular national heritage site following the sign improvement project that was completed in 2010. The analysis was based on a before and after study that relied on a self-completed questionnaire. Data are available from surveys conducted in three different years.

Study team associated different objectives for newcomers and repeat visitors. Newcomers were deemed to be interested in seeing the major attractions. Repeat visitors were considered to be willing to wander off to lesser known attractions in the area. A hierarchical ranking system of attractions was devised to aid the design of the guidance system plan. Signs introduced were classified into three categories.

It is shown that the sign system modification has delivered benefits in terms of increased coverage of attractions and reduced total walking distance to cover a given number of attractions. The sign system improvement has increased the number of attractions visited although the amount of time spent at this park has not changed between the before and after study. This points toward a positive outcome to visitors from the improvement to signs.

There were sensitive property ownership issues that prevented a uniform sign system being introduced everywhere at the site. This may explain why the proportion of repeat visitors getting lost has not decreased with the implementation of the modified sign system. Anyhow, the proportion of newcomers getting lost has been halved with the introduction of the modified signs.

Contrary to expectations, newcomers were shown to visit more attractions during their visit than repeat visitors. A close inspection of route patterns followed by visitors has verified that newcomers tend to focus on quantity of achievements while repeat visitors were willing to take advantage of opportunities to wander around the park.

Detailed analysis of the paths followed by respondents has shown the sign system has successfully guided some to shorter and paths with other attractions. This has also assisted in reducing the amount of traffic flow on some of the congested paths. Major flow pattern remains unchanged and there is no evidence to indicate any of the attractions has been negatively impacted by the modified signs.

Average visitor has increased the number of attractions visited by about 5% after the sign improvement. This indicates a small but noticeable benefit for both visitors and operators of attractions.

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