Cognitive Differences in Japanese and Taiwanese Sight-seeing Information Sign Design

Zheng, Meng-Cong*, Li, Pei-Ying**

** National Taipei University of Technology, zmcdesign@gmail.com*

**Tatung University, zoelady@gmail.com*

Abstract: This study focused on the Japan and Taiwan signage systems, and conducted local experiments to study (1) the relationship between directional signage formats and traveling distances, and (2) sight-seeing route planning using local maps, to understand cognitive differences in visitors' interpretation of the Japan and Taiwan signage systems. The results are as the following: Among the research subjects, a higher percentage of the Japanese (17%) than the Taiwanese (7%) felt that see-through painted directional signage do suggest a sense of distance. Also, a higher percentage of the Japanese (14%) than the Taiwanese (4%) felt that form clarity of a signage do express a sense of distance. On another note, more Taiwanese subjects (24%) than Japanese subjects (7%) felt that contrasting background of a signage do suggest a sense of distance. In segregation by gender, more female subjects than male subjects felt that the length of directional sign, the use of circular or angular corner, and contrasting background do provide a sense of distance. In the experiment on planning of sight-seeing routes, the subjects were more successful in predicting locations of destinations with incomplete addresses when they used the Taiwanese maps that utilize more road names and numeric figures than the Japanese maps.

Keywords: sight-seeing activities, signage design, cognitive differences

1. Introduction

According to the statistics provided by Ministry of Transportation and Communications, in 2011, foreign tourists are mostly Japanese. In Japan's case, the number of Taiwanese tourists came in second. In recent years, more and more Taiwanese and Japanese took self-service trip between these two countries. Because Japan and Taiwan share the same character writing, tourism activities between the two countries have a common basis. It is extremely important that tourists from each country can understand each other and further explore the country. As the world becomes a world village, when designing directional signs, people should realize the cognitive differences influenced by different cultural backgrounds. The purposes for designing directional signs are to make tourists from different cultural backgrounds feel safe when they travel around and thus help them experience local cultures. However, after retrocession in 1945, the street names were changed from Japanese ones assigned in 1922 (Japanese colonial period) into Chinese street names that are used by local residents. In 1947, just two years later, Taiwan Provincial Governor's Office again changed the street names based on toponyms in China. The basis of assigning street names was also changed from blocks to streets. The streets are also named based on the width of

the roadway: “boulevard”, “road”, “street”, “lane”, and “alley.” Though these two environments share the same character writing culture, whether the difference in road planning will influence the tourism development for the two countries will be a topic to explore. Previous studies point out that designs combined maps and directional signs are useful for wayfinding [1]. Research on subway maps shows that people will use the maps to decide the best route. The estimated distance based on simplified maps will always be twice longer than the real moving time. Many research have discussed about individual differences, including underlying spatial abilities [2], sense-of-direction [3], and neural correlates of spatial thinking [4]). Thus, focusing on individual cognitive differences is not only an essential part of enhancing sustainable environment but also a topic that designers of directional signs should take into consideration. This study aims to examine cognitive differences of Taiwanese and Japanese tourists by knowing their understanding of directional signs and asking them to judge distances for two famous tourism spots in Japan and Taiwan. Participants will also be asked to plan and describe the route on a map with the address. By understanding the characteristics and differences of the route-planning by Taiwanese and Japanese tourists, the research hope to gain more insights on integrated design for map and directional signs and to enhance the development of tourism for both countries.

2. Method

There are two experiments in this study. Individual differences of how Taiwanese and Japanese people judge map signs and directional signs will be compared and examined.

2.1 Experiment 1: The relationship between models of directional signs and the moving distance

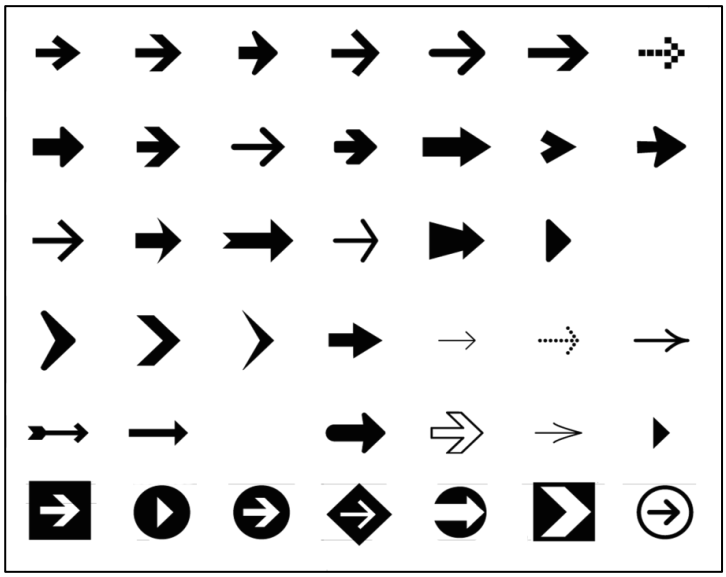

Figure.1 the directional signs samples

The purpose of directional signs is to point out the direction. Previous study [5] shows that directional signs can help tourists to move smoothly and shorten the thinking time. However, simple directional signs still have limitations. People couldn’t estimate how far and how long from the destination is. Thus, the design of directional signs in recent years provides the distance to the destination, even the walking time or driving time to the

destination. In the first experiment of this study, we collected 40 kinds of directional signs in Taiwan and Japan. 30 participants from Taiwan and Japan were invited to perform the experiment. Each participant has to choose which two signs represent the farthest and the nearest sense of distance and pick three signs as presenting long distance and other three signs as short distance. Protocol analysis is used to record the reason why they choose certain signs.

2.2 Experiment 2: The route planning and describing of tourist maps

Directional signs are for pointing out directions. Maps are for route planning when walking. Tourists will need maps to guide them if the destination is certain distance away and multiple transitions are needed. The second experiment of this study will use Google map as the tourist map. Three addresses will be chosen for Taiwan's Tamsui and three for Mojiko in Japan. These two areas are famous coastal tourist spots. There are limited clues for these six addresses. After participants planned the route, they have to imagine if there are people asking for directions, what directions they should give to help tourists. By doing so, we could know the cognitive routes of participants and understand the differences between Taiwanese and Japanese participants. The addresses for the experiment are as follows:

Tamsui in Taiwan

1. No.135-1, Zhongzheng Rd., Tamsui Dist., New Taipei City (Iron-hard preserved eggs)
2. No.68-4, Zhongshan Rd., Tamsui Dist., New Taipei City (food stand)
3. No.32, Zhenli St., Tamsui Dist., New Taipei City (Aletheia University)

Mojiko in Japan

1. 1-12 Higashiminatomachi, Kitakyuusyuushi, Moji-ku Fukuoka-ken (Kitakyushu Commemorative Libarary of International Friendship)
2. 8-14 Sakaemachi, Kitakyuusyuushi, Moji-ku Fukuoka-ken (Tsukasa hotel)
3. 3-2 Oimatsu-cho, Kitakyuusyuushi, Moji-ku Fukuoka-ken (Matsunaga Library)

The experiments in Japan were carried out with Kyushu Institute of Technology's cooperation. By conducting these two experiments, we could understand the cognitive differences on tourist signs between Taiwanese and Japanese and thus reduce the limitation of designing tourist signs.

3. Results

Experiment 1: Cognition of directional signs and the sense of distance

Both Taiwanese and Japanese participants take the size and thickness of the signs as the first criteria for judging distance. The second criteria might be the length of the signs. Japanese participants reported more on "perspective of signs can reflect the sense of distance" than Taiwanese participants (17% > 7%). This also can be seen on how participants think of the clearness of the signs (14% > 4%). Besides, Taiwanese participants reported more on "signs in two contrast colors can reflect the sense of distance" than Japanese participants (24% > 7%). When it comes to gender, females consider the length of signs (70% > 39%), rounded or squared signs (40% > 17%), signs in contrast colors (70% > 33%) are more able to reflect the sense of distance than male participants do. Female participants tend to connect distance with the length of the arrow. Whereas, males think the thickness as one important criteria.

Overall, Taiwanese and Japanese participants will judge the signs based on their own experiences. For example, one participant saw a sign with a long arrow. But he has never seen this sign before, so he didn't feel the sense of distance through this sign. Some participants reported that they have seen similar signs from a long distance, like on highways. They will feel stronger sense of long distance through that kind of signs. From these two examples, we could know that self-experience have considerate influence on judging the distance.

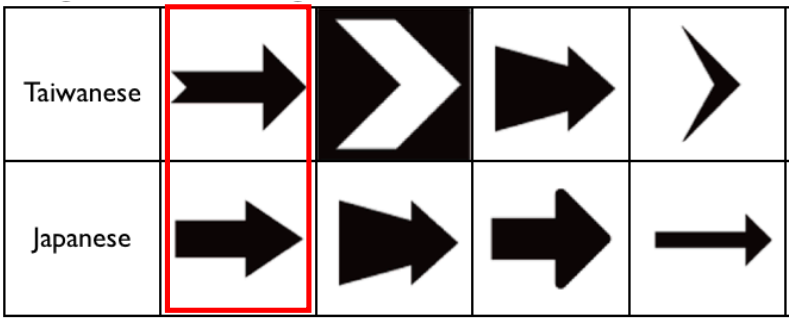

Figure.2 the farthest directional sign

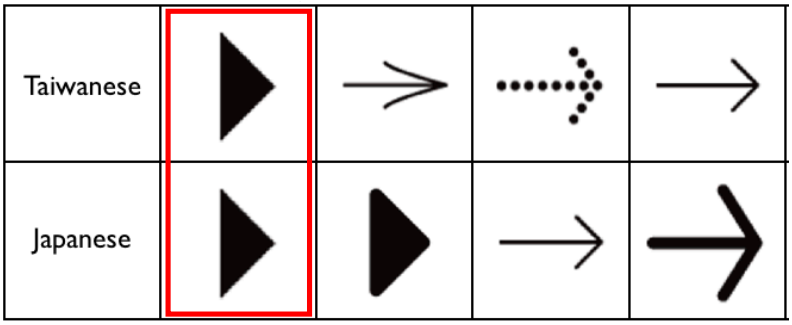

Figure.3 the nearest directional sign

Experiment 2: The route planning and describing of Taiwanese and Japanese tourist maps

As we examined the planned route and the shortest route for the map of Tamsui, Taiwanese and Japanese subjects have similar performance for the first address and the second one. However, for the first address, no subjects could plan the route to the exact destination, though it is not far from the real destination. For the second address, most subjects found the destination (90%). As for the third address, only 17% of the subjects succeeded

in finding the destination. When planning route for the third address, Taiwanese subjects have more precise routes than Japanese ones do.

When examining the result of Mojiko map, Taiwanese and Japanese subjects have similar performance for the first address and the third one. Taiwanese participants planned longer routes than Japanese subjects on the second address (128% > 109%). Taiwanese subjects tend to make more errors than Japanese subjects. They planned more circuitous routes. Routes planned by females tend to be longer or shorter than the ones by males.

Table 1. The difference between the average length of planned route and the shortest distance

	Mojiko map			Tamsui map		
	address 1	address 2	address 3	address 1	address 2	address 3
Male	6%	17%	-8%	-19%	1%	-15%
Female	-6%	24%	-8%	-18%	5%	-14%

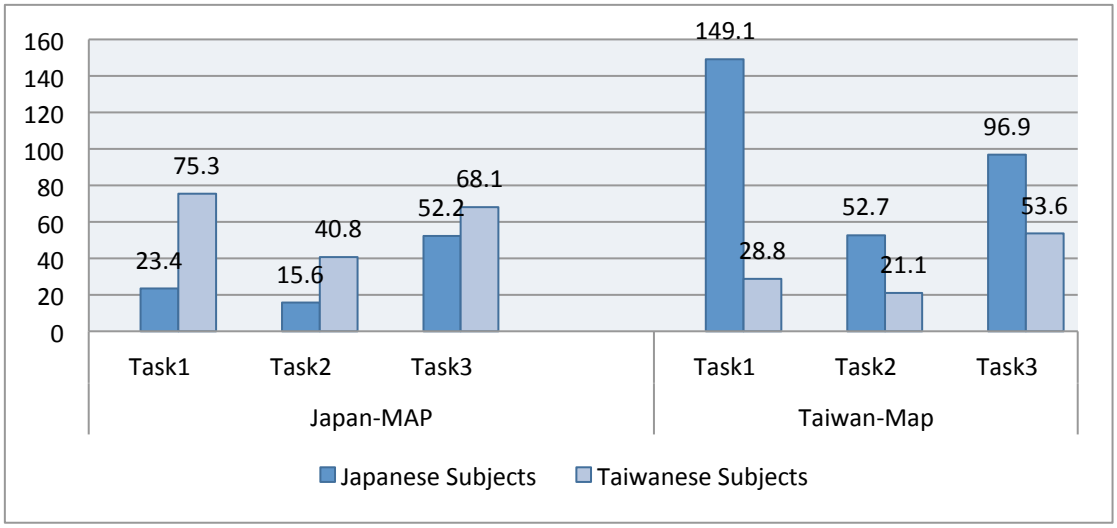

Figure. 4 The time participants spent on planning route for both maps

When Taiwanese subjects planned the route for maps, they spent less time than the Japanese did, especially on the map of Tamsui. On the other hand, Japanese subjects were better at planning routes on the map of Mojiko and spent less time than Taiwanese subjects. The discrepancy of the time spent on planning route for the first address on both maps. We could conclude that it will take longer for participants to read the maps for the first time in order to adapt to the maps and build their logics.

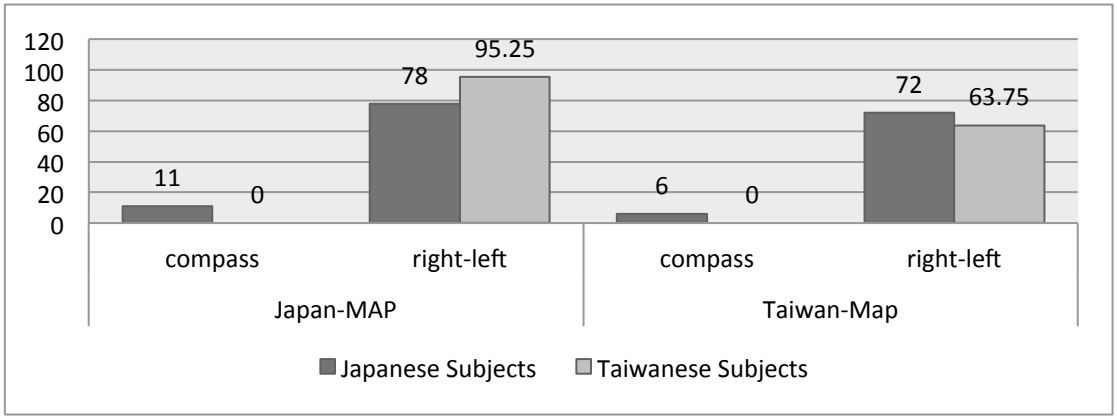

Figure. 5 compass or right-left strategy in participants planning route descriptions for both maps

From the protocol record, a few Japanese participants used the strategy of compass, which means planning the route with the four points of the compass (North, South, East, and West). All of the Taiwanese participants gave directions by using right turns and left turns. Besides, subjects will describe more on the maps they are not familiar with. That is, Japanese subjects had more utterances on Tamsui map and Taiwanese subjects had more utterances on Mojiko map. However, there is no big difference on the number of using landmarks. Subjects tend to use more landmarks on maps they are more familiar with. Furthermore, Japanese subjects will describe the route by using distance, like "go straight for 500 meters." None of Taiwanese subjects use this kind of description.

4. Discussion

Directional signs:

To Taiwanese participants, directional signs with the sense of speed will give them an impression that the distance is long. Take turning signs on Taiwanese highway as an example. Although there is no obvious line on the signs, Taiwanese participants still feels that the signs represent sense of speed and certain distance. But none of Japanese participant considered this kind of signs represent long distance. When choosing which signs represent short distance, more Taiwanese subjects tend to judge from the length of the signs than Japanese subjects. Taiwanese subjects believed that if the distance between the sign and the destination is short, then the sign should be drawn in shorter arrows. Also, to Taiwanese subjects, the wider the angle of the arrow is, the longer distance it represents.

Signs with background in contrast colors will enhance the visibility and help participants to judge the shape of the signs. However, if they never see this kind of signs before, both Taiwanese and Japanese subjects will mistake the signs as the sign of highway in Taiwan, buttons in video games or play button on electrical appliance. In this kind of situation, all of the subjects will change their thinking by focusing on the thickness and the length of the sign rather than defining its distance.

Maps:

The overall characteristics of the three Japanese addresses are as follows:

Mojiko address 1: The area for the participants to define is large

Mojiko address 2: In order to reach the destination, several turns must be made. The participants will plan circuitous routes.

Mojiko address 3: There are not many clues for the destination so most of the participants failed to reach it.

From the results of route planning, we could know that because the destination of the first address for mojiko map is a large area, participant can only guess the approximate range. They couldn't precisely point out the destination. In this case, both Taiwanese and Japanese subjects had similar performance. However, if we examined from the protocol record, Japanese subjects used "railway" and "art gallery" as landmarks. Taiwanese subjects, on the other hand, used "intersection" as the basis. In the issue of gender, males planned 12% longer route than the females did in task 1. In task 2, Taiwanese subjects planned longer routes. In order to reach the destination of the second address, several turns must be made. Participants tried to plan the shortest route but the route turned out to be too circuitous in the end. The distance thus became longer.

As for the task 3, the clues are limited. Subjects could find the same name on the map based on the clues, so most of them failed to reach the destination. Males and females have similar performance in this task. From the routes planned by the subjects, we could see that Japanese planned similar routes. Taiwanese participants planned many different types of route. We could see more personal differences on people who have never been to Mojiko when there are planning routes.

Figure.6 Mojiko map tasks– Taiwanese Subjects

Figure.7 Mojiko map tasks– Japanese subjects

The overall characteristics of the three Taiwanese addresses are as follows:

Tamsui address 1: Participants will follow the sequence of numbers on the roads, but they are misled by the mark of the district office on the map.

Tamsui address 2: There are sufficient clues and no interference. Most participants successfully found the destination.

Tamsui address 3: Participants could not find the number of the address on the map. Most of them failed to find the destination. Those who succeeded judged by other tourist spots or based on their own experiences.

In the task of the first address of Tamsui map, most participants follow the number of the address to estimate the location of the destination. Because there is a mark of the district office, they were misled by the mark and thought the destination is probably near the district office. In fact, the destination is 100 meters away from the office. We could know that marks and signs will influence our judgment for the destination and route planning. In task 2, subjects could have sufficient clues on the map. Although there is no specific number in the lane, most subjects still successfully found the destination. In the task 3 of Tamsui, we provide an address that is similar to the one in Mojiko map. There are limited clues. The result is that most subjects could not find the exact location of the address. More Taiwanese subjects could find the destination successfully probably because they have been to Tamsui and know other tourist spots near the destination. The difference of the planned routes by Taiwanese and Japanese subjects can be obviously seen in task 3.

Figure.8 Tamsui map taks – Taiwanese Subjects

Figure.9 Tamsui map tasks – Japanese subjects

5. Conclusion

When it comes to the issue of mobility, the importance of maps is self-evident. The effect of map coding on map use has been well documented in the cartography literature [3][6]. Colors, visibility, and labels make some stations and lines more prominent in people's cognitive maps than others [7][8]. The way to present the maps will have impact on the cognitive maps in the user's mind. The original design of directional signs, however, is to quickly point out the direction and thus increases the speed of the users. The setting of directional signs is commonly seen in underground space. Recently, the design of directional signs will give information about distance. This kind of information can assist users to precisely estimate the location of the destination. However, from the results of the first experiment (judging directional signs from the shapes and the distance), we could conclude that though most participants share similar logical thinking, they are still influenced by their own experiences. The discrepancy in everyone's own experience could lead to a totally different sense of distance. In other words, the design directional signs should be in a more neutral way. Signs which are controversial or cognitively paradoxical should be avoided. The neutral shapes will have to be defined by ISO. Directional signs should base on shapes that people can have common cognition. This could reduce the errors caused by cultural factors.

In the second experiment, Taiwanese subjects will use road names, streets, and numbers as the basis. Japanese will rely on the concept of blocks. No matter which type of concept they use, subjects can find the clues on the map. Most subjects are able to locate the destination and the accuracy rate is not very different. Only the time for searching the clues will be influenced by their own experience. The most critical situation for users is when there is not enough information on the map and no other information provided. Tourists can only guess based on their own experiences. In this situation, people tend to notice marks and signs on the map. A good example can be drawn from the task 1 in Tamsui. The sign of the district office misled the subjects. Subjects might think the destination is in that area, where obvious marks are placed and they think these marks can help them plan the route more efficiently.

When confirming the destination, how Taiwanese and Japanese subjects judge the destination is closely related to maps. Maps in Taiwan will be drawn by streets. The number of each address will increase by order, thus people can estimate the destination is on the same street or somewhere ahead. Even they couldn't find the destination right away, they will keep going and try to locate it. However, the same thinking logic couldn't be applied in Japanese maps. The number for each block represents different size of land. Even tourists know the number of the blocks, they still couldn't locate where and in which dimension the destination is. Compared to Taiwanese maps, people don't have basis for judging the destination on Japanese maps. When examining the time spent on finding the destination, subjects spent less time when finding the destination in their own country. Although the result won't be definitely correct, we could still conclude that previous experiences can help people to locate the destination. Previous studies illustrates that people often prefer fewer directional turns along a path [9][10], tend to conserve linearity along their paths [11], and follow landmarks (e.g., major stations on a map) in wayfinding even they may not be the most direct path [12]. Thus, road planning based on streets seems to provide more clues on estimating the destination. This research illustrated the cognitive difference in the shape of directional signs and the sense of distance. Through the experiments of route planning, we understood how different road plans in

Taiwan and Japan will influence map users to locate the destination. The results can be references when designing the system of tourist directional signs. Through designing, we hope to enhance the interaction between Taiwan and Japan and reach a mutual understanding

6. Acknowledgement

I appreciate Interchange Association Japan for funding this long study activity and thank Dr. Keitarou Ito from Kyushu Institute of Technology and his graduate students for their help for this study.

7. Reference

[1] Meng-Cong Zheng (2008). *Information Signs Based on Users' Wayfinding Behavior In Transfer Between Above-Ground Staions.* Japanese Society for the Science of Design, 55(6), p1-10

[2] Allen, G. L., Kirasic, K. C., Dobson, S. H., Long, R. G., & Beck, S. (1996). *Predicting environmental learning from spatial abilities: An indirect route*. Intelligence*, 22*, 327–355.

[3] Montello, D.R. (2002). *Cognitive map-design research in the 20th century: theoretical and empirical approaches. Cartography and Geographic Information Science,* 29, 282–304.

[4] Hartley, T., Maguire, E. A., Spiers, H. J., & Burgess, N. (2003). *The well-worn route and the path less traveled: Distinct neural bases of route following and wayWnding in humans*. Neuron, *37*, 877–888.

[5] Meng-Cong Zheng, Tadao Shimizu, Kiminobu Sato. (2008). *Sign Systems Based on Users' Wayfinding Behavior in Transfer between Under-ground Stations*. Japanese Society for the Science of Design, 55(6), p39-48.

[6] Simon, H.A., Larkin, J.H., (1987). *Why a diagram is (sometimes) worth ten thousand words. Cognitive Science,* 11, 65–100.

[7] Garland, K., (1994). *Mr. Beck's Underground Map: A History by Ken Garland. Middlesex: Capital Transport Planning.*

[8] Dziekan, L. (2008). *The transit experience of newcomers to a city – learning phases, system difficulties, and information search strategies*. Paper Presented at the 87th Meeting of the Transportation Research Board, Washington, DC.

[9] Golledge, R.G., Garling, T. (2004). *Cognitive maps and urban travel. In: Hensher, D.A., Button, K.J., Haynes, K.E., Stopher, P.R., (Eds.), Handbook of Transport Geography and Spatial Systems*, 501–512.

[10] Heye, C., Timpf, S. (2003). *Factors influencing the physical complexity of routes in public transportation networks. Paper Presented at the 10th International Conference on Travel Behaviour Research*, Lucerne. <http://www.geo.uzh.ch/~timpf/docs/HeyeTimpfIatbr03.pdf> (accessed February 2010).

[11] Dalton, R.C. (2003). *The secret is to follow your nose: route path selection and angularity. Environment and Behavior,* 35 (1), 107–131.

[12] Vertesi, J., (2008). *Mind the gap: the London underground map and users' representations of urban space.* Social Studies of Science 38 (1), 7–33.