

Role of Maps and Public Street Signs in Wayfinding Behavior by Foreign Visitors



Bochra Bettaieb and Yoshiki Wakabayashi

Abstract In wayfinding behavior, individuals occasionally use public street signs to confirm their current position on the map and find their way. Foreign visitors, in particular, tend to rely on public signs in unfamiliar environments to ensure their position and location. However, few studies in cartography have dealt with the role of signs in wayfinding behavior of tourists and their relationship to maps. This study examined the current status of public street signs, maps, and related issues in wayfinding behavior by foreign visitors. We obtained data on public signs from our fieldwork in Shinjuku District, Tokyo. For the current study, information displayed on 187 signs was recorded, and locations of these signs were geocoded. Data analysis revealed that 65.7% of the signs included a map. In Shinjuku, public signs were unevenly distributed, and many signs were seen in the new urban area situated on the western side of the district. According to the typology of public signs, signs with maps were classified as guiding signs that are used to identify one's current location and find one's way. To prepare for the increase in the number of foreign visitors, most of the signs in Shinjuku displayed pictograms and multilingual annotations. The maps on the signs were aligned with the direction of the viewer to avoid problems caused by the alignment effect. Thus, the direction sign can be regarded as an environmental cue connecting the map and real-world space.

Keywords Public signs · Wayfinding · Guide maps · Foreign visitors · Ubiquitous mapping

1 Introduction

In wayfinding behavior, maps are usually used for planning routes prior to spatial movement. After starting the navigation, travelers must rely on sequentially organized knowledge of landmarks. If they carry a map, they can check whether they are on a planned route or not by identifying landmarks on the map. In the absence of

B. Bettaieb · Y. Wakabayashi (✉)
Department of Geography, Tokyo Metropolitan University, Tokyo, Japan
e-mail: wakaba@tmu.ac.jp

maps, they can identify their current position by monitoring self-movement based on velocity or angle of turn. In an urban environment, public signs may help travelers confirm their current position on the route and find the way to their destination.

Cities in advanced countries have a number of signs, both public and private. In a sense, it is a notable feature of the Japanese (or Asian) cityscape due to the lax regulations concerning billboards. These signs may play a role in enhancing the legibility of a city's pathways (Lynch 1960). In this way, public signs can complement maps in wayfinding behavior by showing the current location and giving direction. Foreign visitors, in particular, tend to rely on signs in unfamiliar environments.

Previous studies on signs have been conducted in the fields of environmental/experienced graphic design, architecture, and transport planning (e.g., Gibson 2009; Calori and Vanden-Eynden 2015). Some psychologists are interested in the role of you-are-here maps in spatial cognition (e.g., Levine 1982).

However, few studies in cartography and Geographic Information Science (GIScience) have dealt with the role of signs in wayfinding behavior and their relationship to maps; an exception is Nestel's (2019) study, which examined the design and function of maps in the environment by analyzing maps and signage at an archeological site. In the context of ubiquitous mapping research, how modern technologies complement or alternate existing maps and signs in the environment has become an important research topic. The aim of this study is to examine the current status of public street signs, maps, and issues related to them in wayfinding behavior by foreign visitors.

2 Data and Method

The data used in this research were derived using two methods—fieldwork and questionnaire survey. For fieldwork, we obtained data on public signs from our fieldwork in Shinjuku District (within 1 km of Shinjuku Station), which is one of the most popular tourist sites in Tokyo. The information displayed on 187 signs was recorded as a geotagged photograph using a smartphone. Thereafter, the locational information of these signs was input as geocoded point data into the GIS.

We employed a questionnaire survey to examine the role of signs in wayfinding behavior. We administered the survey to 200 foreign visitors on the street of Shinjuku in 2017: 100 visitors to the Tokyo Metropolitan Government Office located in west Shinjuku and 100 to Shinjuku Gyoen located in east Shinjuku.

Previous studies on environmental graphic design (e.g., Calori and Vanden-Eynden 2015; Gibson 2009) and cartography (Nestel 2019) have listed several types of signs. Based on these studies, we classified public signs into four types—guiding signs, directional signs, identification signs, and regulation signs (Fig. 1).

- *Guiding signs* are used to identify one's current location and determine one's way. This type of sign generally contains maps.
- *Directional signs* always display arrows to point out a specific path to destinations.

Fig. 1 Typology of public signs



Guiding sign



Directional sign



Identification sign



Regulation sign

- *Identification signs* are located at a destination to identify the place in an environment.
- *Regulation signs* are intended to regulate people’s behavior or prohibit certain activities within an environment.

According to the classification of spatial knowledge by Siegel and White (1975), these signs provide visitors with various kinds of spatial knowledge. Guiding signs provide survey knowledge, directional signs provide route knowledge, and identification signs provide landmark knowledge. Hence, public signs can be used to provide visitors with a variety of spatial information.

3 Distribution of Public Signs

Data analysis revealed that 65.7% of the signs included a map (classified as the guiding sign, shown as a red circle on the map below). Figure 2 illustrates the distribution of signs by type, demonstrating that public signs were unevenly distributed within 1 km of Shinjuku Station. Many signs are seen in the new urban area on the west side of the district, characterized by the development of new streets and buildings after the 1970s. Hence, signs are systematically located in that area.

It was observed that guiding signs are dominant on both sides of Shinjuku. Direction signs are located at street corners to provide route knowledge to visitors. In contrast, there are few identification signs in Shinjuku and only a handful of digital signages equipped with information and communications technology (ICT) on the western side of the district.

The contrast between east and west Shinjuku can be attributed to the differences in the development process and spatial structure. Since west Shinjuku was built following a new development plan, this area has regular broad streets and skyscrapers. Therefore, public signs were systematically placed there. In contrast, east Shinjuku is characterized by disorganized development, irregular narrow streets, and high-density built-up districts.

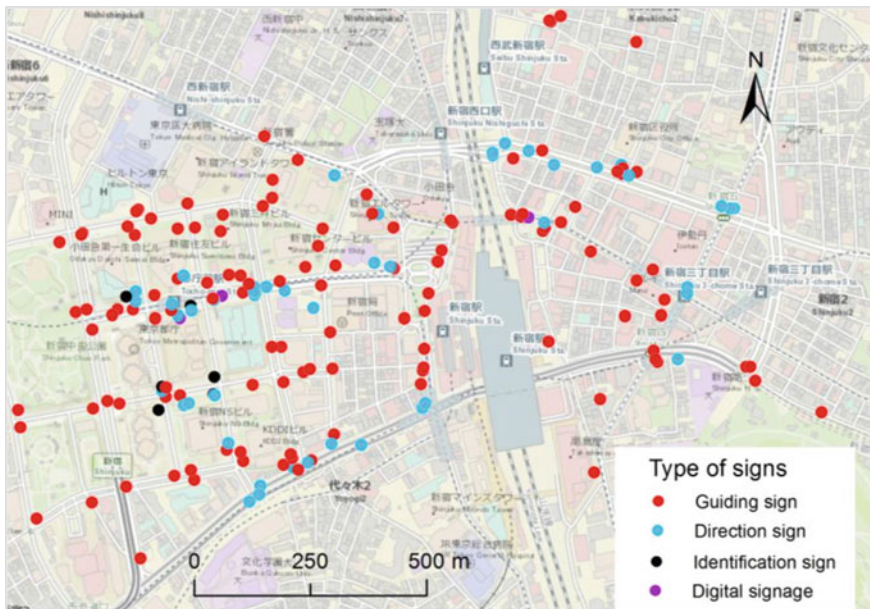


Fig. 2 Distribution of signs in Shinjuku district

4 Expression of Public Signs

Regarding the expression of signs, most of the signs that we observed in Shinjuku displayed multilingual expressions. To prepare for the 2020 Olympic Games, the Tokyo metropolitan government has been promoting the widespread use of multilingual signs for foreign visitors. Moreover, maps of public signs featured pictograms that were comprehensible to foreign visitors. Usually, a guide map is combined with a wide-area map, as shown in Fig. 3, which enables us to ascertain the current location in a city.

A notable feature of the map on a sign is fixed direction, which implies that map readers cannot change the direction of the map. Since most of the maps on signs in Shinjuku were aligned to the direction of the viewer, problems caused by the “alignment effect” described in previous psychology studies can possibly be avoided. In fact, guidelines for public signs set by the municipalities in Tokyo recommend aligning the map with the terrain (Fig. 4).



Fig. 3 Example of the map on signs based on a guideline for public signs by the Tokyo metropolitan government

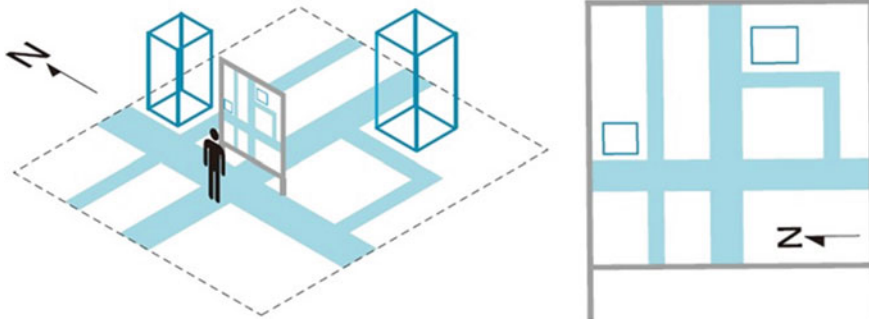


Fig. 4 Guideline of the direction of maps on public signs. *Source* Guideline of public signs in Koto city

In a psychological study on you-are-here maps, Levine (1982) recommended designing you-are-here maps to align the map with the terrain so as to avoid alignment problems. The study provided the following points:

- (1) Provide salient, coordinate labels in both, the terrain and the map.
- (2) Place the map near an asymmetrical part of the terrain.
- (3) Design the you-are-here symbol to indicate the map-terrain correspondence.
- (4) Align the map with the terrain (to avoid the alignment effect).
- (5) Be redundant: that is, use as many of these supplements as possible.

Most of the maps on signs in Shinjuku match these recommendations, particularly the fourth point.

5 Problems of Public Signs

However, there are some problems with public signs in central Tokyo. The first concerns the cultural differences that might arise. Although maps on public signs featured pictograms and multilingual annotations (Fig. 5), we found that the use of pictograms was not uniform and that some expressions might confuse the foreigners. Visitors are thus forced to rely on landmarks because most of the streets have no name, which is inconvenient for those from Western countries.

The second problem is the inconsistency of design and content between facilities or municipalities, which may confuse foreign visitors. Signs within stations or buildings are managed by owners (e.g., railroad companies and prefectures) (Fig. 6), whereas road signs are specified by road authorities. Therefore, addressing the imbalance in the distribution of signs is needed.

Figure 7 presents the variation in you-are-here maps mentioned on public signs. We observe variations in the contents and expressions of maps employed by different cartographers. These maps are made by different divisions of the Tokyo Metropolitan Government, and each division's rules for designing maps is distinct.



Fig. 5 Pictograms specified by Japan industrial standards (JIS)



Fig. 6 An example of direction sign inside a station



Fig. 7 You-are-here maps on public signs

Guidelines for public signs by municipalities recommend maintaining a ledger of signs. Nevertheless, old and current information were observed to coexist in the same map on the sign. Hence, regular inspection and revision should be performed to keep the signs relevant and comprehensible to all (Fig. 8).

To evaluate the role of public signs for foreign visitors, we conducted a questionnaire survey in Shinjuku in 2017. Participants included 200 foreign visitors visiting the eastern and the western sides of the district. The majority of the respondents were from France (34), followed by USA (22), Germany (18), Australia (16), and the UK (11). Answers to the item on tools for wayfinding were analyzed by dividing the sample into east and west Shinjuku.

As shown in Fig. 9, foreign visitors commonly use GPS/smartphones to find their way. In west Shinjuku, public signs are used as much as GPS/smartphones. Nevertheless, a smaller number of respondents use public signs in east Shinjuku because there are few signs there. This indicates the importance of public signs for foreign visitors in finding their way.



Fig. 8 Identification of pubic sign with ledger. Source Itabashi city sign design guideline

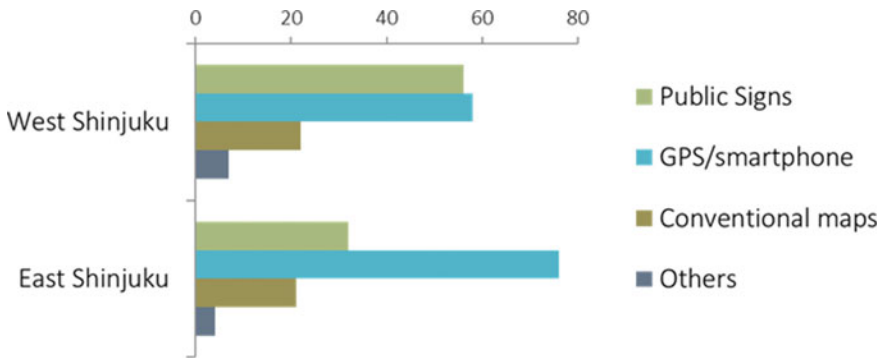


Fig. 9 Tools for wayfinding by foreign visitors (multiple answer)

6 Discussion and Conclusions

Although public signs and maps present on the streets of downtown Tokyo occasionally create problems for foreign visitors’ wayfinding, they have often undoubtedly helped to provide accurate directions through characters and pictograms. Recommendations to mitigate the problems of signs found in this study are as follows.

First, cultural differences can be solved by adjusting the style and content of the map on sign to the style and customs of foreign visitors.



Fig. 10 Examples of application of the ICTs to public signs

Second, problems of inconsistency can be solved by coordination among the administrators of the signs based on specific guidelines.

Third, maintenance problems can be solved by regular inspections and revisions by the administrator of the signs.

The results of the questionnaire survey suggest the possibility of a combination of ICTs and public signs. A viable way to combine public signs with ICTs is to adopt digital signage (Fig. 10a). However, the role of digital signage, which is promoted by the Tokyo metropolitan government, may be limited owing to its limited number, cost–benefit weakness, and issues arising from map making.

Another way is to connect signs with cyberspace by using the quick response (QR) code or radio frequency identification (RFID) (Fig. 10b).

Dickmann (2015) pointed out that the cartographic integration of QR codes is particularly advantageous for digital information transfer, called “cross-media mapping,” due to the easy creation of QR codes.

As an implication for the study of ubiquitous mapping, we can point out two roles of signs in wayfinding. Klippel et al. (2010) mentioned that you-are-here maps are the original form, the grandmother of all location-based services (LBS). The finding from this study of public signs can be applied to indoor navigation, where guiding signs play the role of ubiquitous mapping in a real-world space by showing the current location and direction. Thus, in this manner, the direction sign becomes an environmental cue connecting the map and real-world space. In other words, public signs can be regarded as an annotation of actual size maps in a real-world urban space. In the near future, public signs can be replaced by LBS.

Reference Lists

- Calori C, Vanden-Eynden D (2015) *Signage and wayfinding design: a complete guide to creating environmental graphic design systems*, 2nd edn. Wiley, New Jersey
- Dickmann FD (2015) Cross-media mapping-using optical codes to link paper maps to digital information. *Cartographic J* 52(1):20–27
- Gibson D (2009) *The wayfinding handbook: information design for public places*. Princeton Architectural Press, New York
- Klippel A, Hirtle S, Davies C (2010) You-are-here maps: creating spatial awareness through map-like representations. *Spat Cogn Comput* 10:836–893
- Levine M (1982) You-are-here maps: psychological considerations. *Environ Behav* 14:221–237
- Lynch K (1960) *The image of the city*. The MIT Press
- Nestel C (2019) Designing an experience: maps and signage at the archaeological site of ancient Troy. *Cartographic Perspect* 94:25–47
- Siegel AW, White SH (1975) The development of spatial representations of large-scale environments. In: Rees HW (ed) *Advances in child development and behavior*, vol 10. Academic Press, Amsterdam, pp 9–55