Wayfinding recommendations for the navigation of Taipei's subway system through improved graphic design and sign design

Ying-Hsien Sonya Chen
Iowa State University
Wayfinding recommendations for the navigation of Taipei’s Subway System through improved graphic design and sign design

by

Ying-Hsien Sonya Chen

A thesis submitted to the graduate faculty in partial fulfillment of the requirements for the degree of

MASTER OF FINE ARTS

Major: Graphic Design

Program of Study Committee:
Lisa Marie Fontaine, Major Professor
Sunghyun Ryoo Kang
William J. Grundmann

Iowa State University
Ames, Iowa
2006

Copyright © Ying-Hsien Sonya Chen, 2006. All rights reserved.
# TABLE OF CONTENTS

LIST OF TABLES ........................................................................................................................................ vi
LIST OF FIGURES ........................................................................................................................................ vii
ACKNOWLEDGEMENTS .......................................................................................................................... xv
ABSTRACT ...................................................................................................................................................... xvi
CHAPTER 1. INTRODUCTION .................................................................................................................. 1
CHAPTER 2. LITERATURE REVIEW ......................................................................................................... 4
    2.1 THE WAYFINDING PROCESS ........................................................................................................... 4
    2.2 WAYFINDING AND PERCEPTION .................................................................................................. 5
    2.3 SEMIOTICS ........................................................................................................................................... 8
        2.3.1 Pictographs and Symbols ........................................................................................................... 9
        2.3.2 Semiotics: Variations Among Culture and Gender ................................................................. 12
        2.3.3 Culture and Color ..................................................................................................................... 12
    2.4 GENDER AND WAYFINDING STRATEGIES ............................................................................... 13
    2.5 WAYFINDING STRATEGIES ......................................................................................................... 15
    2.6 WAYFINDING CRITERIA .................................................................................................................. 17
        2.6.1 Universal Design ....................................................................................................................... 17
            2.6.1.1 Mounting Height ............................................................................................................. 18
            2.6.1.2 Type Size ......................................................................................................................... 20
            2.6.1.3 Font Proportion ............................................................................................................... 20
            2.6.1.4 Amount of Words Per Line ............................................................................................. 24
            2.6.1.5 Type Contrast Against a Background Color ................................................................. 24
        2.6.2 Color ............................................................................................................................................ 24
            2.6.2.1 Color and Emotion .......................................................................................................... 25
            2.6.2.2 Color as Code .................................................................................................................. 26
        2.6.3 Navigational Aids ..................................................................................................................... 27
            2.6.3.1 Directional Signage ......................................................................................................... 27
            2.6.3.2 Identification Signage .................................................................................................... 29
2.6.3.3 Orientation Signage (Maps) ........................................... 29
2.6.4 Typography ........................................................................ 30
   2.6.4.1 Clear Typography ....................................................... 30
   2.6.4.2 Legibility ................................................................. 31
2.6.5 Clarity of Information .......................................................... 33
   2.6.5.1 Clutter ................................................................. 33
   2.6.5.2 Hierarchy ................................................................. 34
2.6.6 Consistency ......................................................................... 35
2.6.7 Location ................................................................................ 36
2.6.8 Material ............................................................................... 37
2.6.9 Lighting ................................................................................ 37
2.6.10 Architecture ....................................................................... 38
2.6.11 Security and Comfort .......................................................... 39
CHAPTER 3. METHODOLOGY .......................................................... 40
  3.1 VISUAL INVENTORY OF TAIPEI SYSTEM .................................. 41
    3.1.1 Subway System ............................................................... 42
      3.1.1.1 Subway System: Directional Sign ............................. 42
      3.1.1.2 Subway System: Orientation Sign ......................... 50
      3.1.1.3 Subway System: Identification Sign ....................... 52
      3.1.1.4 Subway System: Emergency Signs ......................... 56
      3.1.1.5 Subway System: Placement ................................. 60
      3.1.1.6 Subway System: Memory Assistance ..................... 62
    3.1.2 Adjacent Sign Systems: Shopping Malls and Station Front
       Metro Mall ................................................................. 63
    3.1.2.2 Adjacent Sign Systems: Taiwan Railway Administration .... 70
3.2 Criteria for critique of the system: (Function + Consistency) .......... 73
3.2.1 Universal Design

3.3 Criteria Used in the Evaluation of Taipei’s Wayfinding Signs:

3.3.1 Typography

3.3.1.1 Character height:

3.3.1.2 Character considerations:

3.3.1.3 Character spacing considerations:

3.3.2 Clarity of Information

3.3.3 Consistency

3.3.4 Location

3.3.5 Material

3.3.6 Lighting

3.3.7 Architecture

3.3.8 Safety Issue

3.4 FIELD OBSERVATION

CHAPTER 4. FINDINGS

4.1 CRITICAL ASSESSMENT OF THE SYSTEM

4.1.1 Universal Design

4.1.2 Typography

4.1.3 Clarity of Information

4.1.4 Information Arrangement and Quantity

4.1.5 Alignment and Grouping

4.1.6 Symbols

4.1.7 Consistency

4.1.7.1 Terminology Consistency

4.1.7.2 Typeface Consistency

4.1.7.3 System Consistency
4.1.7.4 Location Consistency ...........................................102
4.1.8 Location .......................................................................103
4.1.9 Lighting .......................................................................108
4.1.10 Architectural and Material Considerations ....................108
4.1.11 Safety ........................................................................110

4.2 SURVEY RESULTS..................................................................111
4.2.1 User Profile: .................................................................111
4.2.2 Summary .......................................................................115
4.2.3 RECOMMENDATIONS BASED ON SURVEY RESULTS ........116

CHAPTER 5. CONCLUSIONS ..........................................................118

5.1 IMPLICATIONS FOR FURTHER STUDY AND BROADER APPLICATION ........122

APPENDIX SURVEY INSTRUMENT ..................................................123
BIBLIOGRAPHY ......................................................................136
NOTES ................................................................................142
LIST OF TABLES

Table 1. Information used to determine the size of visual characters based on mounting height and viewing distance................................................................. 20

Table 2. Number of participants divided by age range and gender ........................................... 111

Table 3. Number of overall participants divided by frequency of usage............................... 112

Table 4. Number of foreign participants divided by their frequency of usage ....................... 112

Table 5. First time Taiwanese users...................................................................................... 113

Table 6. Daily and familiar users............................................................................................ 115
LIST OF FIGURES

Figure 1. Universal Health Care Symbols ................................................................. 10
Figure 2. Escalator .................................................................................................. 10
Figure 3. Telephone ................................................................................................. 10
Figure 4. Stairs-up/down ...................................................................................... 11
Figure 5. Information .............................................................................................. 11
Figure 6. Exit ........................................................................................................ 11
Figure 7. Parking ................................................................................................... 11
Figure 8. Left: example of: icon, middle: index, right: symbol ................................ 11
Figure 9. A clear connection between users and townscape .................................. 16
Figure 10. Minimum required headroom for overhead sign .................................... 19
Figure 11. SEGD recommendation for the range of character body ...................... 21
Figure 12. SEGD recommendation for the range of stroke width ......................... 21
Figure 13. Acceptable typefaces ........................................................................... 22
Figure 14. Unacceptable typefaces ....................................................................... 23
Figure 15. Recommendation for font proportion ratio ........................................... 23
Figure 16. A contrast comparison between type and its background .................... 24
Figure 17. Various examples of sign's location and proper arrow indication ........ 28
Figure 18. AIGA arrow shape recommendations .................................................. 29
Figure 19. Right: A serif typeface, Left: a sans-serif typeface ............................... 31
Figure 20. Coney Island Hospital, Hillier Group .................................................... 33
Figure 21. Boston Children's Hospital Identification Design .................................. 34
Figure 22. Tokyo TRTA Subway ............................................................................ 34
Figure 23. The floor patterns and furniture show a good consistency .................... 36
Figure 24. (Danshui line) ..................................................................................... 42
Figure 25. Red line .......................................................................................................................... 42
Figure 26. Directional sign showing various lines at platform ....................................................... 42
Figure 27. Directional sign indicates downstairs platforms .......................................................... 42
Figure 28. Directional sign tells user to choose the right side for the red line ......................... 42
Figure 29. Go straight to the Bannan Line (blue line) .................................................................. 43
Figure 30. Left arrow indicates Taiwan Railway Administration (TRA), but right arrow
indicates one of the underground mall ....................................................................................... 43
Figure 31. Blue line indicational .................................................................................................... 43
Figure 32. Unusual directional sign in the system ......................................................................... 43
Figure 33. Go straight to reach blood donation room ................................................................. 44
Figure 34. Public telephone directional sign ................................................................................ 44
Figure 35. Directional sign for two adjacent malls ......................................................................... 44
Figure 36. Oversize directional sign .............................................................................................. 44
Figure 37. Directional sign mounted .............................................................................................. 44
Figure 38. Inconsistent directional sign compared to others ........................................................ 44
Figure 39. Elevator directional sign .............................................................................................. 45
Figure 40. Directional sign close to the restroom .......................................................................... 45
Figure 41. Directional signage mounted on pillar with complex sign layout ............................... 45
Figure 42. Directional sign mounted on pillar with transfer information ..................................... 45
Figure 43. Upstairs is TRA transfer Area ....................................................................................... 45
Figure 44. Directional sign located at the main entrance .............................................................. 46
Figure 45. Directional sign combines elevator information and exit information ...................... 46
Figure 46. Difficult arrow shape. Photo by author .......................................................................... 46
Figure 47. Different exits’ information .......................................................................................... 46
Figure 48. Sign indicating different exits ...................................................................................... 46
Figure 49. Exits/Entrances indicator .............................................................................................. 47
Figure 50. Directional sign using image ........................................................................ 47
Figure 51. Temporary sign overlaid ........................................................................ 47
Figure 52. Directional sign showing multiple destinations .................................. 47
Figure 53. Combination: directional above orientation ........................................ 48
Figure 54. Combination: orientation above direction ......................................... 48
Figure 55. Directional sign shows the exit/entrance ............................................. 48
Figure 56. MRT Taipei Main Station directional sign with color-coding .......... 49
Figure 57. Restroom directional sign ................................................................. 49
Figure 58. Exit/Entrance sign located at station ............................................... 49
Figure 59. Color coding directional sign .......................................................... 49
Figure 60. Combination sign of orientation and direction ................................ 50
Figure 61. Orientation map with transfer information ...................................... 50
Figure 62 Route map with bicycle access information .................................. 50
Figure 63 “You are Here” indicator to help users’ orientation ....................... 50
Figure 64. Orientation map combined with cross section elevation .............. 51
Figure 65. Identification with transfer route located at platform .................... 52
Figure 66. Station identification sign on pillar .................................................. 52
Figure 67. Platform 1 identification ................................................................ 52
Figure 68. Station identification sign ............................................................... 52
Figure 69. Telephone identification ................................................................ 53
Figure 70. Accessible elevator .......................................................................... 53
Figure 71. Elevator identification sign ................................................................ 53
Figure 72. Exit identification combined with bus transfer information ........... 53
Figure 73. Exit identification with big Arabic numbers .................................... 53
Figure 74. Exit identification with big Arabic numbers .................................... 54
Figure 75. Station entrance identification in context ....................................... 54
Figure 76. Detail of restroom identification, example 1 ....................................... 54
Figure 77. Detail of restroom identification, example 2 ....................................... 54
Figure 78. Various restroom identification ............................................................. 55
Figure 79. Multiple signs gathered shows restroom’s location and using huge icons .... 55
Figure 80. Directional sign, variation 1 ................................................................. 56
Figure 81. Directional sign, variation 2 ................................................................. 56
Figure 82. Directional sign, variation 3 ................................................................. 56
Figure 83. Directional sign, variation 4 ................................................................. 56
Figure 84. Directional sign, variation 3 shown in context ..................................... 56
Figure 85. Fire fighting equipment map ............................................................... 57
Figure 86. Directional sign lit from inside ............................................................. 57
Figure 87. Location of emergency sign shown in context .................................... 58
Figure 88. Detail for emergency sign ................................................................. 58
Figure 89. Similar to variation 1 with a huge Chinese emergency description ......... 58
Figure 90. Variation 2 without English type ......................................................... 58
Figure 91. Identification for emergency ............................................................. 58
Figure 92. Detail of identification for emergency ................................................... 58
Figure 93. Emergency sign obscured by the commercial sign ............................. 59
Figure 94. Safety issues illustrated and described ................................................ 59
Figure 95. Directional sign with color-coding ....................................................... 60
Figure 96. Combination directional sign ............................................................. 60
Figure 97. Oversized signs .................................................................................... 61
Figure 98. Station identity .................................................................................... 61
Figure 99. Red circle indicates perpendicular sign mounted to the wall ............... 61
Figure 100. Directional sign indicates transfer information ................................. 61
Figure 101. Inside of Taipei’s subway displays museum artifacts of Taipei’s history .... 62
Figure 102. Colorful wall of one adjacent mall (Taipei New World Shopping Center) ..... 62
Figure 103. Same adjacent mall........................................................................... 62
Figure 104. Neon rainbow stairs captivate users’ attention .................................... 62
Figure 105. TRA directional sign system ............................................................. 63
Figure 106. Directional sign on this pillar shown cluttered with ads. ...................... 63
Figure 107. Station Front Metro mall ................................................................. 63
Figure 108. Directional information on huge sign ................................................. 63
Figure 109. Directional sign in Station Front Metro mall ..................................... 64
Figure 110. Telephone sign in the Station Front Metro mall .................................. 64
Figure 111. Directional sign indicates exits .......................................................... 64
Figure 112. Directional sign in between movie ads or posters ............................... 64
Figure 113. Overall exits information in Station Front metro mall ....................... 65
Figure 114. Exit identification and bus connection information ........................... 65
Figure 115. Exit information only in Chinese except Arabic number .................... 66
Figure 116. Dressing area: toward North 11 exit .................................................. 66
Figure 117. Directional sign indicating various areas and exits with street names..... 66
Figure 118. Orientation combined with directional information ........................... 67
Figure 119. Orientation sign with “you are here” indicator .................................. 67
Figure 120. Entrance/exit with only in Chinese except Arabic number ................. 67
Figure 121. Directional sign with enough contrast between text and its background... 68
Figure 122. Directional sign only in Chinese ...................................................... 68
Figure 123. Typical directional sign of TRA ...................................................... 69
Figure 124. Signs with outlined directional arrows .............................................. 69
Figure 125. Combination sign with direction information above orientation map .... 69
Figure 126. TRA wayfinding system .................................................................. 70
Figure 127. Emergency sign with outlined arrow ................................................. 70
Figure 128. Combination sign of direction and identification ........................................ 70
Figure 129. Ambiguous color-coded sign ..................................................................... 71
Figure 130. Multiple signs grouped at one location ...................................................... 71
Figure 131. TRA Station identification ........................................................................ 71
Figure 132. Exit directional sign in TRA platform ....................................................... 71
Figure 133. TRA Passenger Train Timetable .............................................................. 72
Figure 134. Recommended ratio between width and height ......................................... 76
Figure 135. Recommended spacing (b or c) based on stroke width (a) ......................... 77
Figure 136. Large Arabic number used in consideration for all users ......................... 82
Figure 137. Huge orientation for overall subway route with "you are here" ................. 83
Figure 138. Route map indicating bicycle access ....................................................... 84
Figure 139. The temporary sign, indicated by the red circle ....................................... 86
Figure 140. A comparison of using a combination of uppercase and lowercase
               versus all caps .................................................................................................. 86
Figure 141. Existing sign with tight leading between Chinese characters .................... 87
Figure 142. Existing sign shows a wider leading between Chinese characters ............ 87
Figure 143. Better Chinese character spacing in China airport .................................. 87
Figure 144. Another example about better spacing .................................................... 87
Figure 145. Not enough contrast .................................................................................. 88
Figure 146. Cluttered signs which should be combined into one sign ....................... 88
Figure 147. Existing Arrow Design ............................................................................ 89
Figure 148. Recommend Arrow Designs ..................................................................... 89
Figure 149. Information 1.2.3 indicated by question icon .......................................... 89
Figure 150. Passenger Servence Center indicated by question icon ............................ 89
Figure 151. Sign lacks a floor identity at the top of blue area ...................................... 90
Figure 152. Floor indicator is reinforced by color-coding .......................................... 90
Figure 153. Toilet directional sign caused perception confusion .............................................. 90
Figure 154. A downward movement is shown with an upward arrow........................................... 91
Figure 155. Incorporate emergency sign as general combination .................................................. 92
Figure 156. Combination sign 1: Includes problems 1 and 3 .......................................................... 92
Figure 157. Combination sign 2: Includes problems 1 ................................................................. 92
Figure 158. Combination sign 4: Problem 2 ..................................................................................... 93
Figure 159. Inconsistent directional signs everywhere, resulting in a cluttered message .......... 93
Figure 160. Parallel and perpendicular sign solution to avoid clutter ......................................... 94
Figure 161. A decision point that is encountered from four different directions .......................... 94
Figure 162. Detail of Figure 161 ..................................................................................................... 94
Figure 163. Chicago Transit Authority (CTA) “T” Station ............................................................. 95
Figure 164. Existing design layout .................................................................................................. 96
Figure 165. Proposed design solution with cleaner alignments ...................................................... 96
Figure 166. Existing sign shows poor layout and weak symbol for Zhongshan Metro Mall . 97
Figure 167. Design solution showing improved organization ......................................................... 97
Figure 168. Red circle indicates poor existing logo design ............................................................ 98
Figure 169. Proposed design solution improves ............................................................................. 98
Figure 170. TRTS directional sign of accessibility route ................................................................. 99
Figure 171. Inconsistent terminology on a brochure’s map ............................................................. 99
Figure 172. Chinese typeface variation 1 ......................................................................................... 100
Figure 173. Chinese variation 2 for ............................................................................................... 100
Figure 174. Chinese typeface variation 3 ....................................................................................... 100
Figure 175. A broad range of type size variety .............................................................................. 100
Figure 176. Common combination ceiling over hanging sign .......................................................... 101
Figure 177. Red arrow indicating the same type of sign ............................................................... 101
Figure 178. Wrong color-coding sign ........................................................................................... 102
Figure 179. Correct color-coding for exit information .................................................. 102
Figure 180. Consistent color-coding in a Chicago station ........................................... 102
Figure 181. Flush mounted on the ceiling ................................................................. 103
Figure 182. Flush mounted to the pillar ................................................................. 103
Figure 183. Flush mounted on the wall ................................................................. 103
Figure 184. Bad location for directional sign ......................................................... 103
Figure 185. Incorrect arrow placement ............................................................... 104
Figure 186. Obscure sign location between huge ad displays ............................... 104
Figure 187. Hard to notice sign’s location between two ad displays ..................... 105
Figure 188. Red circles indicate elevator signs in an obscure location .................... 106
Figure 189. Elevator sign in second avenue subway at New York city .................. 106
Figure 190. Existing sign with a recommendation for a better location for the sign ... 107
Figure 191. Proposed overhead sign, using both sides of the sign panel ............... 107
Figure 192. Emergency sign ............................................................................... 108
Figure 193. Spotlight with glossy signage surface .............................................. 108
Figure 194. Too much distraction from shops ...................................................... 109
Figure 195. Too much distraction ....................................................................... 109
Figure 196. Distracting lights ............................................................................... 109
Figure 197. Glossy signage material causing reflective glare ............................. 109
Figure 198. Too small emergency sign, and it is not a universal emergency signage .. 110
Figure 199. Thailand subway exit sign ................................................................... 110
Figure 200. Gender comparison graph of first time Taiwanese users ................. 114
ACKNOWLEDGEMENTS

Here I would like to express my deepest appreciation to those who really helped me with various aspects of conducting research and the writing of this thesis. First and foremost, thanks to my dear parents and family; without their encouragement and assistance I could never have continued this study. They accompanied me throughout the whole process and my entire school life. Second, I want to say thank you to my major professor, Lisa Fontaine, because her professional conduct and guidance helped open my eyes to the field of wayfinding. Next, thank to my committee members, Sunghyun Kang and William Grundmann, who taught me a lot about the various aspects of userability testing and gave inspiration to my research. I must also thank Art and Design chairman Roger Baer because of his willingness to encourage and support students by joining and being helpful in any conference relevant to their research. I would add to that appreciation list other Iowa State University professors: Debra Satterfield, Michael Golec, Arvid Osterberg, Lynn Paxson, Paula Curran, Paul Bruski, Barbara S. Schwarte, and John M. Levis for their professional inspiration in various fields and their providing generous photos. In addition, many thanks to all the people who supported and helped me by taking transportation photos when they traveled to different countries. These include Haeinn Lee, Platt A. Supimol W’Dumrong, Li Yu, Ben Armfield, Blake Ma & Betty Ma, and Yi-Yin Chen. Finally, I would thank all the people who volunteered in participate in this research. You all have made this paper possible.
ABSTRACT

Developing graphic design recommendations for a successful wayfinding system in a space that serves both internationals and locals is an especially difficult task since the target audience is so broad. In addition, unique challenges occur with dual language use. The purpose of this study was to analyze the existing wayfinding system in the Main Station of Taipei’s MRT subway system, and to determine effective ways for improving audience navigation and orientation through the system. The analysis of the existing Taipei signage system was based on a range of visual communication criteria adopted from previous professional studies and on the universal design criteria adopted from the Americans With Disabilities Act (ADA). In addition, user survey was conducted with 100 participants in MRT Taipei. The study examined the relative importance of color-coding, typography, dual language use, information hierarchy, and consistency of approach. Recommendations for improved navigation were based on these criteria.
CHAPTER 1. INTRODUCTION

In 2002, the author visited her hometown of Taipei and its major subway station, and immediately got lost. Strangely, even though the signs were written in Chinese, it was quite confusing. For example, directional signs were all cluttered together on one pole or on one narrow wall. There was no space between the individual signs, making it difficult to separate one from another. Although each sign had both Chinese characters and English type, it was still very hard to recognize or read either language. Unfortunately, this is the typical dual language signage of the Taipei subway system. Two more areas of confusion on those signs were that directional arrows lacked a consistent approach, and some signs were below the reader’s line of vision, causing reading difficulties. This experience caused the author to wonder if the criteria for developing good wayfinding was universal, or if dual language signage presented unique challenges.

Wayfinding is a very broad discipline, related to architecture, graphic design and semiotics. In wayfinding, there must be differences between the signs of a western program and an eastern program, since their typographic systems have different needs. For example, when one reads in Chinese, one usually starts from the right to left and reads vertically. English is read from left to right, and read horizontally. These different reading habits would also affect the clarity of dual language signage. Another difference is that usually the Chinese letter is squarer and more heavy where as English letter is more fluid and simple. So the layout of dual language signage will be very complex. This study began with the question: are the unique challenges of a dual language system the main problem in the Taipei system, or are there other problems that could be improved upon through the application of universal wayfinding criteria? Wayfinding factors include seeing and perception, which can be related to people’s cognitive maps. How are cognitive maps associated with wayfinding? Eastern and western cultures perceive space and experience space differently, which affects
the ways they structure cognitive maps in their brains. Does this also affect the way they navigate through a space?

The purpose of this study was broadened to analyze the existing wayfinding system in the Main Station of Taipei’s MRT subway system, and to determine effective ways to improve audience navigation and orientation throughout the system. Since Taipei is a very international city, the first task was to understand the differences in western and eastern people's perceptions of an international city. Existing literature suggests that both the cultural context and the environmental context could be seen as those external objects that would influence people. After people receive that external information, they start to respond from their internal cognitive map. This interaction is then built up as people add repeated experiences and memories of a space. In other words, people store those experiences in their brains, and those experiences become their own cognitive maps.

After a review of the existing literature, a methodology was developed to analyze the Taipei navigation system. A visual inventory of photo examples was created; then a set of assessment criteria was developed, based on the literature review and personal experience. On-site analysis and user surveys were conducted in the Taipei Main Station. There were 100 participants in this survey during the summer of 2005. Combining the assessment criteria and the information collected on site, some recommendations were made to accomplish an optimal wayfinding design for Taipei’s subway.

In addition, several comparison examples from other cities’ transportation systems were studied. For example: The directional signs of Chicago Transit Authority (CTA) show a good consistency and a clear alignment. They also use color-coding effectively throughout the system. Taipei lacks this consistency and clarity. These comparisons helped in developing recommendations to assist people navigating through international cities.

A good wayfinding design system must cooperate with its context. For example, most parts of architectural structures can provide opportunities for signage location. Also the
use of lighting can help define the spaces in which we live, work, and travel. In addition, good signage design requires clear readability and color contrast. Orientation maps are also helpful in a wayfinding system. It is necessary to follow universal design guidelines in order to direct all people clearly.

The methodology and recommendations also present implications for further study. For example, there need to be accessibility standards developed similar to the Americans With Disabilities Act (ADA) for use with Asian characters. There is currently a lack of general standards to follow when designing dual language signage, so future research could focus on this challenge.

An effective wayfinding system could accomplish more than just efficiency; it could also communicate Taipei’s respect for its international visitors by trying to make their experience comfortable and give them a positive impression of Taiwan’s capital. The author’s love for Taipei City has driven this investigation, with the hope of making some contributions for Taipei in the future.
CHAPTER 2. LITERATURE REVIEW

2.1 The Wayfinding Process

Wayfinding is an activity that demands complete involvement with the environment. Perceptual and cognitive processes are constantly in action when a person sets out to reach a destination. According to urban planner Kevin Lynch, “a distinctive and legible environment not only offers security but also heightens the potential depth and intensity of human experience.”1 Wayfinding specialist Romedi Passini elaborates: “Wayfinding defined in terms of spatial problem solving is generic. It includes perceptual and cognitive phenomena and the various ways a person can relate to the spatial environment and to destination; it involves memory and learning,”2 He saw wayfinding as a process that correlates to the human’s cognitive mind and how humans navigate through a space. He also explained wayfinding as a process of how humans perceive their environments and react to them. “Wayfinding is a dynamic affair. It involves a movement through space and a continuous involvement in reading, interpreting, and representing space”. Wayfinding is a very complicated subject that involves many issues related to human’s cognition. Passini suggests that …

… spatial orientation or the semantically more appropriate term of wayfinding be defined as cognitive processes comprising three distinct abilities: a cognitive-mapping or information-generating ability that allows us to understand the world around us; a decision-making ability that allows us to plan actions and to structure them into an overall plan; and a decision-executing ability that transforms decisions into behavioral actions. Both decision making and decision execution are based on information generated by cognitive mapping.3

In addition, this cognitive-mapping process keeps changing. A viewer sees a symbol or action first, and then starts to process that information in his or her brain. The decision-making or planning will be the next step to accomplish. This step can also be called
the perceiving stage. So the process of wayfinding also reveals the process of seeing and perception.

2.2 Wayfinding and Perception

In considering the process of perception, we can study the theory by German art historian Erwin Panofsky who claims that any action performed by humans in our everyday life is the process of “receiving information” in three phases. The first phase is called the “primary or natural meanings phase.” Both the factual and the expressional meaning may be classified together. He further explained this phase by giving an example of two friends’ greeting each other. When one person lifts his hat, what the other person sees, from a formal point of view, is just the change of certain details within the general pattern of color, lines and volumes constituting our world of vision. This is the representation of the first phase.

The second phase is called the “secondary or conventional subject matter phase.” Continuing the above example of two friends greeting each other, when the second person saw that action, he started to frame this action based on his existing knowledge. This process of relating visual information to existing knowledge of the subject is what Panofsky called conventional subject matter. In other words, the first phase is perceptual while the second phase is intelligible. If the viewer’s cultural background taught him that the action should be recognized as a polite greeting, the viewer has continued to the third phase which is called the “Intrinsic meaning or content phase.”

To recap the greeting example, after the second person identifies, as he automatically does, this configuration as an object (gentleman), and the change of detail as an event (hat-lifting), he has stepped over the limits of purely formal perception and entered the first sphere of subject matter or meaning which is factual meaning. It is apprehended by simply identifying certain visible forms with certain objects known from practical experience, and then by identifying the change in their relationships with certain actions or events. We could
not construct a mental portrait of the man on the basis of this single action, but only by coordinating a large number of similar observations and by interpreting them in connection with our general information as to his period, nationality, class, intellectual tradition, and so forth.

In other words, Panofsky’s theory about seeing and perception is a process containing three stages. The first stage is seeing, the second stage is processing information, and the last stage is interpretation. These three stages also can be applied to the wayfinding process. For example, the viewer sees the sign or symbol during the natural seeing stage. Then the viewer starts to process the sign or symbol against previously stored information. The new information starts to interact with the viewer's previous knowledge including education, cultural background, and experience in the space. This interaction leads to the final stage, which will be the combination of both new and old information. In other words, the viewer will perceive and interpret that symbol before taking some action based on the interpretation, which is the response stage. Keep in mind that the first stage is very critical because if the viewer perceived wrong information, it will cause a wayfinding problem. So a well-considered wayfinding system would provide common symbols or indicators based on universal common language or knowledge.

Since wayfinding is relevant to the human cognitive mind, it can be explained as *habitus*. According to French linguist Pierre Bourdieu, *habitus* is an ingrained disposition to act, think and feel in a particular way. Patterns of individual experience also have a strong impact. So each person's *habitus* is a complex mixture of nationality, class, family, gender, and his or her own distinctive individuality. This can also be related to habit response meaning. One recent study by Kuniyoshi Kataoka involving wayfinding and the human cognitive mind incorporates Bourdieu’s theory⁶. “In addition, it must be noted that spatial knowledge is not simply external or internal to the individual”. For Kataoka, the human cognitive mind relates to wayfinding in a broader sense. In other words, the environment and
context, such as society, will influence an individual. He explained that, “spatial activity in the public space is constrained by the domain-specific praxis embraced by each community, through which we are socialized into a habitualized use of space”. This is supported in the work of social linguist Benjamin Lee Whorf:

This fact is very significant for modern science, for it means that no individual is free to describe nature with absolute impartiality but is constrained to certain modes of interpretation even while he thinks himself most free. The person most nearly free in such respects would be a linguist familiar with very many widely different linguistic systems. As yet no linguist is in any such position.

From his theory we can see a human’s cognitive mind is tightly connected with his or her environment and surroundings. Even if a person is an individual free body; his or her internal perception is influenced by many external factors. From these researchers’ theory, we can see how habitus is related to wayfinding, and we can understand how different language speakers will develop different cognition and perception.

A wayfinding designer needs to gain more understanding of cross-cultural habits, in order to serve the wide range of user groups in international cities. According to the Whorfian hypothesis,

Language provides a screen or filter to reality; it determines how speakers perceive and organize the world around them, both the natural world and the social world. Consequently, the language you speak helps to form your world-view. It defines your experience for you; you do not use it simply to report that experience. It is not neutral but gets in the way, imposing habits of both looking and thinking.

What it means is that language can influence an individual’s perception and that different languages are based on different cultural backgrounds. Eastern culture is different from western culture. People who grew up in different cultures will have different perceptions when they experience the same space. This might also occur when they see the same signage. The challenge, then, is to find the cross-cultural knowledge based on common perceptions.
When doing wayfinding design, we need to use the most universal symbols possible. By doing this, we can communicate faster and easier. A wayfinding designer must realize that a user’s language is the basis for many broad issues affecting their perception of a space. Meanwhile, we still have to consider what is the most common culture for end users. Since the majority of the users in Taipai’s subway are local Taiwanese, the subway’s wayfinding system must be based primarily on their common perception.

2.3 Semiotics

In human society, we use different signs and codes to communicate with each other, and share similar habits with each other. These signs are also called “semiology” or “semiotics” in the pioneering writing of Ferdinand de Saussure, where it was defined as “the science which studies the life of signs in our social interaction.” These signs can be any gesture, body language or symbol. In addition, color, shape, and size also can be attributes of semiotics. Another basic definition comes from visual semiotician Daniel Chandler:

Semiotics involves the study not only of what we refer to as ‘signs’ in everyday speech, but of anything which ‘stands for’ something else. In a semiotic sense, signs take the form of words, images, sounds, gestures and objects. Contemporary semioticians study signs not in isolation but as part of semiotic ‘sign-systems’ (such as a medium or genre). They study how meanings are made and how reality is represented.

In the wayfinding field, designers should clearly know about semiotics in order to create more meaningful and functional signage for users. For example: A shopping mall wayfinding system might have many pictogram signs. If the designer does not research or study the context of the site, it may result in an unrecognizable pictogram for end users. Designer Philip Meggs explained semiotics as the general meaning of signs and sign-using behavior.

A sign is a mark or language unit that stands for or denotes another thing. The plus sign for addition, the letter A for a specific spoken sound, the word apple, and a
A simple pictograph of an apple are all signs. A sign and its object have a simple connection. They form a pair, bonded by a direct one-to-one relationship. A three-way relationship exists between the signified, the signifier, and the interpreter. The signified is the thing that is represented (an apple). The signifier is the sign that represents it (the word *apple* or a pictograph of an apple). The interpreter is the person who perceives and interprets the sign. The interpretation of a sign is impacted by the context in which it is used, its relationships to other signs, and its environment.11

As in the study introduced by Panofsky, semiotic theory focuses on how people socially interact to communicate with each other. There are two aspects of signs: one is the Signifier, and the other is the Signified.

The words ‘You may park here’ and the blue-and-white sign P are completely different signifiers, but each of them expresses the same signified. Signification, the link between expression and concept, depends upon rules, codes, which are tacitly accepted by a community, and these rules are the area which semiology seeks to explore.12

As you can see from the above passages, both text signs and image signs can communicate the same concept to an audience. Most emergency or exit signs almost universally use a green running man. It is a message everyone understands; when you encounter danger, run as quickly as you can in the direction of the green arrow. It is the same idea as the red word “exit” often used for emergency signs. The green example and the red example are completely different signifiers, but they both express the same signified.

The study of semiotics considers gender differences, social group differences, and cultural differences.13 As with *habitus*, these differences will affect how different people interpret a sign.

### 2.3.1 Pictographs and Symbols

In wayfinding design, there are many chances to deal not only with text-based information, but also deal with image-based information. Semiotic research indicates that image is one form of communication to reach the audience.
Modern examples of pictographs indicate gender-separate restroom facilities, overnight lodging, eating areas, acceptable smoking and nonsmoking environments, and eating establishments...modern pictographs and ideographs communicate simple messages across multiple languages and cultures.\(^{14}\)

According to wayfinding experts Colette Miller and David Lewis: “Symbols have the potential to be a universal language, but there may be cultural differences in how they are understood. However, some symbols are used so frequently that they are easily understood with little chance of confusion.”\(^{15}\) Miller and Lewis’s idea is that those frequently used symbols can function as universal symbols. According to wayfinding specialist Craig M. Berger, “Pictographs mainly served an informal function until the second half of the 20\(^{th}\) century, when air travel and expanding world immigration increased, causing universal symbols to increasingly serve as an international communications tool.”\(^{16}\)

![Figure 1. Universal Health Care Symbols. Clockwise: Elevators, Restaurant, Women’s Room, Telephone. Source: Craig M. Berger. Universal Symbols in Health Care Workbook. (SEGD, 2006), 2:2.](image)

Clearly, a wayfinding system needs to incorporate such universal symbols, especially in an international city such as Taipei, because it serves both international and local users. Figure 2 through Figure 7 shows examples of universal symbols now in international use.

![Figure 2. Escalator.](image)  ![Figure 3. Telephone.](image)
American philosopher C.S. Peirce categorized images as an icon, index, or symbol. According to Per Mollerup, “While icons and indices are motivated signs, symbols are arbitrary signs. Icons and indices may be divided into subclasses.” While icons show a visible similarity to the object they represent, an index is associated by causation. In semiotics, the term symbol refers to an arbitrary link to the object that has been learned by the audience. From Peirce’s theory, an icon should be a picture that is easy to understand for most people. An index should be something that represents another thing through a causal relationship. It shows a logical connection between the signified object and the index.

For example, if we want to design a logo for ship, an icon will be a recognizable ship, whereas the indexes will be ocean, wind, anchor, and sail. A symbol has a learned meaning, and there is no logical connection between this meaning and the symbol itself. For example, codes and sign language can be seen as symbols. There are different coding systems based on different cultures. One common coding system we use everyday is traffic coding, where most codes are universal. Some codes, however, are still different based on different cultures.
No matter what image based signs you deal with, there are general rules of thumb when designing; these include simplicity, uniqueness, and clarity. Simplicity can reinforce the message in the audience’s memory. Uniqueness can provoke the audience’s mind and attention. Clarity can deliver the message quickly and correctly to the audience.

2.3.2 Semiotics: Variations Among Culture and Gender

Panafosky’s theory is based on culture and suggests why cultural differences influence human cognitive development. Other researchers have explored cultural differences in perception. University of Michigan researchers claim that Asians look at the world more in background, as a whole picture. They tend to perceive the overall concept, rather than the details. Conversely, Americans look at the world more in foreground. As previously mentioned, cultural differences can be traced from the language used for communication. According to Ronald Wardhaugh, “Different speakers will therefore experience the world differently insofar as the languages they speak differ structurally.” Edmund Leach, Professor of Social Anthropology at the University of Cambridge, also wrote about the results of cultural difference. “It is perfectly possible that every individual perceives his world to be what his or her cultural background suggests.”

Studies all agree that cultural background differences will lead to different perceptions in people.

2.3.3 Culture and Color

We use color to communicate and express ourselves. The cultural component of color is very important when using color in a wayfinding system. We must research carefully before using certain colors to deliver our message to audiences. What does a particular color mean to our audiences? There are some cultural differences in terms of associating meaning with color. According to Tuan’s research about color in 1974,

Red signifies blood, life, and energy... In China, red is the color used in weddings for it symbolizes life and joy... In China, yellow dominates because it is perceived to be
the color of earth and of the center; but this attribution is not widespread. In English, ‘green,’ ‘growth,’ and ‘grass’ are derived from the Germanic root gro which probably meant “to grow.”

In today’s Chinese culture, we also see the color green as meaning growth, open-minded, friendly, and peaceful. Gray represents graceful and smart. Blue represents calm and quiet. Orange represents cheerful and sporty. White is still familiar with death activities, but that feeling is not as strong as the traditional view. In Chinese traditional culture, it is forbidden to use any completely white hat. It was always assumed that since white was associated with death, a white hat that will bring you bad luck. In today’s Chinese culture, more and more people wear completely white hats. Also since many younger Chinese people are influenced by western culture, they do not feel so negative about wearing completely white clothing. Tuan’s research also supported that, “it is well known that in the Western tradition black stands for all the negative values of curse, evil, defilement, and death, whereas white signifies joy, purity, and goodness.”

One color expert, Leatrice Eiseman, elaborates:

Historically white has been a color associated with mourning in the Chinese culture. Currently white is being used not only in everything from T-shirts to wedding gowns, but on airplanes as well. This change in attitude is especially true for the younger people in many cultures who are less bound to tradition and more open to change.

As we can see from her suggestions, updated color research will be necessary in order to get a more universal understanding of our message. Culture is changing and so are audiences. Continuing to research colors can ensure that the colors used in designs are more suitable in terms of the cultural groups within our audiences. The wayfinding designers should be sensitive to colors and should be aware of their target cultural context.

2.4 Gender and Wayfinding Strategies

City planner Kevin Lynch wrote that “The human organism is highly adaptable and flexible, and different groups may have widely different images of the same outer reality.”
This could be explained through cultural differences and gender differences, for example Asian versus American, and male versus female. Since the educational background is different among different groups, their perception will also be different. Humans use different communication methods or different communication strategies since their cognations are different. Males and females are biologically different individuals, and this gender difference makes their cognitive communication different in wayfinding strategies. There are two major way-finding strategies: the orientation strategy and the route strategy. Carol Lawton published a study noting wayfinding differences between genders.

Women were more likely to report using a route strategy (attending to instructions on how to get from place to place), whereas men were more likely to report using an orientation strategy (maintaining a sense of their own position in relation to environmental reference points).^24^

Lawton’s subsequent research repeated her findings. In a 2002 study, she claimed women usually use the route strategy in wayfinding, and men usually use the orientation strategy in wayfinding. Lawton performed two studies about gender and cultural differences in wayfinding strategies and anxiety about wayfinding. Men in both Hungary and the United States reported greater preference for a strategy of orienting to global reference points such as the cardinal directions (North, South, East, West), whereas women reported greater preference for a strategy based on route information. Lawton found that women like to rely on landmark-based route information, while men prefer to rely on orientation with global reference points or the position of the sun in the sky. Additional resources also support gender difference in wayfinding strategies from Doreen Kimura’s book *Sex and Cognition* published in 2000. “A common finding from studies on traversing a route is that, when giving directions, women tend to use landmarks as referents, while men tend to use distance or cardinal directions (N, S, E, W).”^25^ Clearly, using landmarks is one kind of route strategy in wayfinding and using cardinal directions is one kind of orientation strategy.
2.5 Wayfinding Strategies

Lynch questioned how cities could make their images more vivid and memorable to the city dweller. His research explored three American cities (Boston, Jersey City & Los Angeles) and recommended a method for dealing with visual form at the urban level. According to Lynch, people who lived in the city must have an important relationship with some part of the city. The city’s image is rooted in memories.

He considered the visual quality of the American city by studying the mental image of that city which is represented by its people. Clarity or legibility is important to a modern city. Lynch’s theory can be applied to a subway’s wayfinding system. For example, since Taipei’s subway serves both local citizens and international visitors, it will be important to show its local identity but still use universal signage to assist people efficiently. As Lynch wrote, “An environmental image may be analyzed into three components: identity, structure, and meaning.” A good wayfinding system must tightly interrelate all three elements to each other in order to make the user’s experience meaningful. For example, landmarks provide some kind of meaningful identity, which helps users to reinforce their mental map while they navigate through the subway. For this reason, landmarks are referred to later in this thesis as “memory assistants.”

A similar suggestion about identity was developed in the research of Robert Venturi and Scott Brown as they developed their method to investigate Las Vegas in order to understand the city’s image. They found that casinos that served monumental purposes in the past no longer communicate this without their infamous neon lighting, since this is so important to Las Vegas’s identity. Lynch’s book introduced categories for the wayfinding elements of the city: paths, edges, districts, nodes, and landmarks. While Lynch used theses categories in studying a city, these categories also can be used to investigate a subway’s wayfinding system. In wayfinding, horizontal and vertical paths are walkways. Edges are walls and boundaries. Lynch explained districts as “having
two-dimensional extent, which the observer mentally enters ‘inside of’, and which are recognizable as having some common, identifying character.” For example, in Taipei’s subway, there are the TRA station and the many malls adjacent to it. These are named as different districts. *Nodes* are decision points or junctions. A *landmark* is a building, sign or mountain, etc. According to Lynch’s definition of landmark, “They are frequently used clues of identity and even of structure, and seem to be increasingly relied upon as a journey becomes more and more familiar.”

Humans tend to get lost when they are in an underground structure, according to Akase & Yokota, “Therefore, the visualization of landmarks and identification of the individual’s location in connection with the townscape aboveground were the two basic requisites setup for the system” (Figure 9). These two Japanese designers investigated some good examples of Japan’s subway design from 1972 to 1993.

![Hatchôbofi Sta. Area Map](image)


Furthermore, Lynch’s book also suggested the use of field analysis to get to know the city one is designing for in order to know exactly what is needed. The field analysis should eventually result in a map of the area that indicates the interrelations among the landmarks,
paths, edges, and so forth. This map should show use abstractions, not representations of physical reality.

2.6 Wayfinding Criteria

Information presented thus far was based on semiotics, cultural difference and perception. These provide a general framework for studying wayfinding related issues. In order to analyze an existing navigation system, however, we must look at more specific and applied criteria. These include the following concerns: universal design, color, navigational aids, location, typography, legibility, clarity of information, material, lighting, architecture, and consistency.

2.6.1 Universal Design

This well known term is about design that concerns itself with both physical and mental disabilities. Especially in the wayfinding field, people who have physical disabilities should be considered more carefully in order to give them the most helpful design solutions. A more updated definition for universal design is any design or product that serves equally well for both individuals with or without a disability. For example, the universal design door handles are easier to use than traditional doorknobs for both people without a disability and for people with disabilities involving manual dexterity. According to universal design specialists Arvid E. Osterberg and Donna J. Kain in their *Access for Everyone: A Guide to the Accessibility of Buildings and Sites with Reference to ADAAG* at 2005:

Design should work well for all people, regardless of variations in ability. This philosophy, known as “universal design,” is a more effective solution than design that incorporates “special” features in buildings for people with disabilities (such as mechanical lifts and ramps). Special design features result in separate and different experiences for many people whereas universal design serves people with different needs without discrimination.
In the *Universal Symbols In Health Care Workbook*, Craig M. Berger points out that there is still no general signage rules or regulations related to disabilities for use outside the U.S. The most reliable guidance in the USA is from the Americans with Disabilities Act (ADA). While the ADA guidelines focus only on signage with English text, their universal design considerations would be applicable to other languages as well. The JMU Access Partnership for the Disability Rights Commission (DRC) has worked to publish a special guide about producing written information for people with learning disabilities. Those methods using a range of symbols and signs can be applied to international settings.\(^{30}\)

There is evidence that the use of pictures and symbols on signage are of help to people with learning difficulties, as often they are more intuitive than text. However, where images relate to something non-standard, or specific to a particular location, then extra consideration is needed to avoid confusion.\(^{31}\)

The report further identifies other wayfinding criteria for learning disabled people:

The use of features, landmarks, varied materials and textures along a route or in a building have also been identified as a key means of wayfinding...when route learning takes place, "on route" information is dominant and takes precedence over all off route information. The use of sounds has been identified...as a valuable source of locational and directional information for both people with visual or learning disabilities.\(^{32}\)

Landmarks are important for the learning-disabled users. They serve two functions: First as an orientation cue, and second as a special memory location.\(^{33}\)

Another good point brought up in this report is the use of sound. Because disabilities sometimes include those with poor vision, it will be more difficult for them to get information correctly from the signage. Sound would be extremely helpful for that specific user group.

**2.6.1.1 Mounting Height**

The Society for Environmental Graphic Design (SEGD) has prepared an extensive resource related to the Americans with Disabilities Act (ADA) regulations. These regulations
consider aspects of universal design related to vision and mobility impairments. For example, Figure 10 shows the recommended height for overhanging signage. Eighty inches of headroom is the minimum requirement for overhanging ceiling signage, with a 3-inch minimum cap height.

Figure 10. Minimum required headroom for overhead sign. Source: Arvid E. Osterberg and Donna J. Kain. Access for Everyone-A guide to Accessibility of Buildings and Sites with References to ADAAG. (Iowa State University, 2005), 121.
Table 1. Information used to determine the size of visual characters based on mounting height and viewing distance. Source of Figure 10 and table1: Arvid E. Osterberg, and Donna J. Kain. Access for Everyone-A guide to Accessibility of Buildings and Sites with References to ADAAG. (Iowa State University, 2005), 121.

<table>
<thead>
<tr>
<th>Mounting height from floor to character baseline</th>
<th>Viewing distance</th>
<th>Minimum character height</th>
</tr>
</thead>
<tbody>
<tr>
<td>a less than 40 in. (1015 mm) only allowed in elevators</td>
<td>only allowed in elevators</td>
<td>only allowed in elevators</td>
</tr>
<tr>
<td>b 40 in. (1015 mm) to less than or equal to 70 in. (1780 mm) less than 72 in. (1830 mm)</td>
<td>0.625 in. (16 mm)</td>
<td></td>
</tr>
<tr>
<td>c 40 in. (1015 mm) to less than or equal to 70 in. (1780 mm) 72 in. (1830 mm) and greater</td>
<td>0.625 in. (16 mm), + 0.125 in. (3.2 mm) per 12 in. (305 mm) of viewing distance above 72 in. (1830 mm)</td>
<td></td>
</tr>
<tr>
<td>d 70 in. (1780 mm) to less than or equal to 10 ft. (3.01 m) less than 15 ft. (4.57 m)</td>
<td>2 in. (51 mm)</td>
<td></td>
</tr>
<tr>
<td>e 70 in. (1780 mm) to less than or equal to 10 ft. (3.01 m) 15 ft. (4.57 m) and greater</td>
<td>2 in. (51 mm), + 0.125 in. (3.2 mm) per 12 in. (305 mm) of viewing distance above 15 ft. (4.57 m)</td>
<td></td>
</tr>
<tr>
<td>f greater than 10 ft. (3.01 m) less than 21 ft. (6.40 m)</td>
<td>3 in. (76 mm)</td>
<td></td>
</tr>
<tr>
<td>g greater than 10 ft. (3.01 m) 21 ft. (6.40 m) and greater</td>
<td>3 in. (76 mm), + 0.125 in. (3.2 mm) per 12 in. (305 mm) of viewing distance above 21 ft. (6.40 m)</td>
<td></td>
</tr>
</tbody>
</table>

With respect to blind people, all identification signage that is wall mounted must have both Braille and standard text.\textsuperscript{35}

2.6.1.2 Type Size

According to Miller and Lewis, “typeface and x-height-sans serif typefaces with large x-heights are more legible at particular type sizes than serif typefaces with small x-heights at the same type size.”\textsuperscript{36} Also, the lightweight typefaces should be at a larger type size when being used for the same viewing distance as a bold typeface.\textsuperscript{37}

2.6.1.3 Font Proportion

SEGD’s the Americans with Disabilities Act: White Paper, uses a percentage measurement for font proportion:

SEGD proposes that the range for character body be between 55% and 115%, and for stroke widths be between 8% and 33%. A separate set of conditions should be established for letterforms intended for tactile use only on signs where visual and tactile components are separate.\textsuperscript{38}
See Figures 11 and 12 for an illustration of the percentage measurement. Figures 13 and 14 are the resulting acceptable and unacceptable typeface choices for best legibility.

**Figure 11.** SEGD recommendation for the range of character body. Image by author.

**Figure 12.** SEGD recommendation for the range of stroke width. Image by author.
<table>
<thead>
<tr>
<th>ABCIOabc0123</th>
<th>ABCIOabc0123</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodoni</td>
<td>Bodini Book</td>
</tr>
<tr>
<td>ABCIOabc0123</td>
<td>ABCIOabc0123</td>
</tr>
<tr>
<td>Gill Sans</td>
<td>Helvetica</td>
</tr>
<tr>
<td>ABCIOabc0123</td>
<td>ABCIOabc0123</td>
</tr>
<tr>
<td>Gill Sans Bold</td>
<td>Helvetica Bold</td>
</tr>
<tr>
<td>ABCIOabc0123</td>
<td>ABCIOabc0123</td>
</tr>
<tr>
<td>Century Schoolbook</td>
<td>Futura</td>
</tr>
<tr>
<td>ABCIOabc0123</td>
<td>ABCIOabc0123</td>
</tr>
<tr>
<td>Garamond</td>
<td>Futura Condensed Bold</td>
</tr>
<tr>
<td>ABCIOabc0123</td>
<td>ABCIOabc0123</td>
</tr>
<tr>
<td>Palatino</td>
<td>Optima</td>
</tr>
<tr>
<td>ABCIOabc0123</td>
<td>ABCIOabc0123</td>
</tr>
<tr>
<td>Palatino Bold</td>
<td></td>
</tr>
<tr>
<td>ABCIOabc0123</td>
<td></td>
</tr>
<tr>
<td>Times</td>
<td></td>
</tr>
</tbody>
</table>

Figure 13. Acceptable typefaces. Image by author.
Another recommendation about font proportions is from Paul Arthur and Romedi Passini, “Good signage letters have an ‘x-height’ to cap-height ratio of at least 3:4.”\textsuperscript{39} In other words, the type proportion can be measured by x-height and cap-height, and the height of the x-height must be not less than 75\% of the cap-height, as shown in Figure 15.
2.6.1.4 Amount of Words Per Line

With the exception of directories, the normal amount of words per line on signs should not exceed 4 or 5 words. Being concise will help users to memorize information easier when they navigate through a space. Another reliable theory in exhibition design also provides information about amount of words per line:

Use a line length for text that facilitates reading. Text containing too many characters on a line is difficult to read. Exhibit text should have a maximum of 55 characters (average) per line. Narrower columns, with 45-50 characters per line, are preferable. In other words, if we use the average English word as 5 letters, the max is 11 words per line and the min is 9 words per line.

2.6.1.5 Type Contrast Against a Background Color

SEGD’s *White paper* also gives a clear recommendation about the contrast of type against a background color:

Characters and symbols are ‘recommended’ to have a minimum 70% contrast with their background. Most paint and ink manufacturers will provide a list of reflectance values for specific colors. Remember, however, that even black and white are never absolutely 0% or 100%, so care must be taken with the use of black or white copy together with a color, to ensure that a 70% contrast is obtained.

![Figure 16. A contrast comparison between type and its background. Image by author.](image)

2.6.2 Color

Color usage must be determined carefully, since not all colors communicate universally. Although different cultures have different color perceptions, black, white and
red are colors of universal significance." Also Leatrice Eiseman wrote in her book, "Cross-culturally, there are some generalities that can be made about the human response to color, largely because of the psychological associations and physiological reactions to color that are universal."

Even though there are various perceptions of color depending on various cultures, one still can choose more universal colors in a wayfinding system to prevent audience confusion while they are navigating through a subway. Eiseman says that red always provokes attention because red is associated with blood and fire, two important elements of a human’s life. This agrees with Tuan’s research from 1974. Red easily catch’s the audience’s attention. This is why today we usually use red for exit or emergency signage and stop signs. Green provokes the opposite response from the audience. According to Tuan, green is associated with plants and growth in the great majority of cultures. In a similar statement about green, Eiseman said, “people feel secure and safe in its presence.” This is why today many emergency signs also use a green running man to communicate a safer place.

2.6.2.1 Color and Emotion

Color also affects human emotion. Eiseman identifies different emotional impacts that result when people see different colors:

- Red: dynamic, stimulating & exciting, provocative
- Pink: youthful, happy & sweet, spirited
- Orange: inviting, friendly & vital, tangy
- Yellow: enlightening, warming & sunny, cheerful
- Brown: sheltering, wholesome & rich, durable
- Blue: quiet, dependable & cool, serene
- Green: nature, refreshing & healing, fresh
- Purple: spiritual, sensual & elegant, mysterious
- Neutrals: natural, classic & quality, quiet Neutrals are regarded as “safe” non-offensive.
- White: pristine, pure & bright, innocent
- Black: mysterious, strong & classic, elegant
These color definitions correspond generally to human emotions. But differences within a color will create different emotional effects in the audience. According to Interior designer John F. Pile, “Recent research suggests that the impact of colors is less determined by hue than by intensity. Thus a strong red or green has similar interpretive value as exciting and stimulating.” In other words, you must be careful when you deal with color in wayfinding design. Each color’s intensity must be tested with the end user group or tested in public in order to convey the right message to the audience.

2.6.2.2 Color as Code

After learning about colors, a designer can consider using “color-coding” in the wayfinding system. There are many advantages to using color-coding in wayfinding design. According to Miller and Lewis, “It can help to simplify a site, and can be used to reduce the amount of information on signs, ...” When you have elderly users, color-coding also seems good for aiding their navigation. Janet R Carpman and Myron A Grant wrote, “In environments for elderly users, color can be used to organize a series of rooms so that they appear to be grouped in some way.” In other words, color-coding can give users clear information related to certain categories.

Dutch wayfinding expert Paul Mijksenaar suggests making sure the audience has learned or is able to learn the “color-coding” before starting to apply a color system. It is impossible for the audience to receive the message if they do not have any chance to learn and perceive the meaning behind the color-coding. Mijksenaar acknowledges the limitations of color-coding:

Another problem is the lack of standardization in colour coding. Even the use of green to indicate escape routes is not recognized world-wide. In the United States and in every aeroplane, for example, escape routes are routinely red. The use of colour code is a good idea for the sake of quick recognition, but only as a ‘redundant’ method of relaying information. Not to mention the relevancy of a world in which 8 percent of the male population is colour-blind.
What he was saying is that although color can communicate to the audience instantly, don’t rely on color-coding too much. There are more disadvantages with color-coding at healthcare sites according to Miller, “Research has shown that people can remember no more than five colours before they find it difficult to differentiate between the colours.” In addition, if the context is full of color, the color-coding will not be as effective as intended. Color will also be critical when you deal with wayfinding design based on universal design principles. The JMU report wrote that;

The use of color has been identified as a general method of assisting wayfinding, not just for people with learning disabilities. This is advocated by the NHS as a useful way of identifying different buildings and routes around a complex site. In addition color has been used to good effect. For example, in Priors Court School for children with learning disabilities, separate areas of the school are identified by different colors. Others have identified the benefits of painting doors to similar services such as toilets in a single color.

Clearly, color can assist in wayfinding design, but we must keep in mind that some people are colorblind or have other problems which will prevent them from making use of a color-coding system. The JMU report also said: “…there are potential problems to consider when using colour to assist in wayfinding. Around 8% of men and 1% of women have colour impaired vision and would gain limited benefit from a colour coded system.” The evidence for incorporating color into wayfinding design is not 100% positive, but the use of color remains as one possibility.

2.6.3 Navigational Aids

Signage used as navigational aids can be placed into three categories: Directional, Identification, and Orientation. Following are detailed definitions for each category.

2.6.3.1 Directional Signage: The most common process description is the directional sign. Directional signs are for providing directional information. Any kind of sign that directs
users to their destination is considered to be directional. Directional signs are different from other signs because they have arrows with them to tell users the direction to travel.

Arrows are important to the clarity of directional signs. “Factors such as the speed at which a viewer is traveling, color of the arrow and its background, and the viewing angle...[all] affect legibility, with speed the factor that influences legibility the most.” In other words, during the arrow design process, the most important activity is to test on site, giving specific attention to the speed factor. Placement of arrows is also important. Figure 17 shows recommendations about the relationship between the signage placement and arrow placement. For Signs above eye level, use a down arrow to indicate straight ahead, and an up arrow to indicate straight ahead. But signs at or below eye level use an up arrow to indicate straight ahead.

![Figure 17. Various examples of sign's location and proper arrow indication. Source: John John Follis and Dave Hammer. Architectural signing and graphics. (New York: Whitney Library of Design, 1979), 70.](image)

Follis is also concerned with the shape of arrows. Instead of bending an arrow in order to show something is around the corner, he suggests a diagonal arrow. The American
Institute of Graphic Arts (AIGA) also provides recommendations for arrow clarity; these are shown in Figure 18.

![AIGA arrow shape recommendations](http://www.aiga.org/content.cfm?ContentID=147)

**Figure 18. AIGA arrow shape recommendations.** Source: "Symbol signs" 2006 [AIGA | the professional association for design] [cited 20 March 2006], available from http://www.aiga.org/content.cfm?ContentID=147

2.6.3.2 **Identification Signage:** These help people to know that they have arrived at their destination. It is the most basic description of a location. The purpose of this signage is to provide identification information for a business or a room. For example: the identification signage is based on the use of each space. According to wayfinding professionals Miller and Lewis, a location sign serves as the identification of a location. In order to give users a clear cue that they arrived at their destination, it is necessary to make an identification sign distinguishable from the rest of the signs. The following guidelines are provided: 1) Make a different position between identification and directional sign, 2) Color and style should be distinguishable.

2.6.3.3 **Orientation Signage (Maps):** These help people to perceive their location in an overall environmental context. The purpose of this signage is to provide orientation information. Spatial orientation is defined by Paul Arthur and Romedi Passini; as “the process of devising an adequate cognitive map of a setting along with the ability to situate oneself within that representation.” There are two key concepts related to spatial orientation. They are *cognitive map* and *cognitive mapping*. Arthur and Passini further defined these two terms. “Cognitive map: an overall mental image or representation of the spaces and the layout of setting. Cognitive mapping: the mental structuring process leading to the creation of a cognitive map.” They also wrote that the destination is more important than the
traveling process when designing a subway route map. According to Craig Berger, different modes will require different types of maps. Terminals, such as airports and large rail facilities, typically require a plan directory to highlight major functions, including ticketing, information, retail, rest rooms, waiting, and boarding.

Maps are important in a wayfinding system because users have different starting points and different destinations. Verbal descriptions are economical when there is only one route that is taken by all users. However, when everybody has the same destination but approaches from a different direction, everyone would need a different description. In such situations, it makes sense to provide a map that contains the different approach routes. The map may require more effort than the verbal description of a single route; but it is of more general use as it serves to indicate different routes. Accordingly, when we want to support finding different destinations from a given location, it makes sense to provide a map. Also, maps help users to add to their cognitive map of the space. Akase & Yokota also support the importance of maps in wayfinding design. The visualization of landmarks and the identification of the individual’s location in connection with the townscape above ground were the two basic recommendations of these researchers.

In the wayfinding field, you-are-here maps are very helpful to assist users in finding their way. Carpman and Grant provided helpful information related to designing maps:

Because the purpose of you-are-here maps is to orient facility users, it is essential that the information be presented clearly. The map should be oriented so that “forward is up;” that is, if the visitor is facing east while looking at the map, the map should be oriented so that east is at the top of the map.

2.6.4 Typography

2.6.4.1 Clear Typography
When dealing with typographic issues in wayfinding, the first thing to consider is whether the typeface is appropriate for use on signs.\textsuperscript{78} Basically, typefaces fall into two categories, serif and sans serif. Figure 19 shows examples of these two categories.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{typefaces.png}
\caption{Right: A serif typeface, Left: a sans-serif typeface. Image by author.}
\end{figure}

According to Miller and Lewis, “X-height of a typeface affects overall type size and viewing distance.” They also mentioned that people usually read words quickly by identifying the shape of a word rather than reading it letter by letter. Designers should avoid “using all upper case letters, particularly on signs with more than two or three words.”\textsuperscript{79}

For the weight of the type use only a single font with bold weight for major information.\textsuperscript{80}

\section*{2. 6.4.2 Legibility}

Wayfinding designers must also consider if the message on the signage is readable to the audience; this is called legibility. Legibility has been defined as the “ability to read.” There are various factors that affect legibility of text, such as text size, spacing between words, and spacing between sentences or lines. There are “three qualities upon which legibility is dependent: contrast, simplicity, and proportion.”\textsuperscript{81} So, legibility is partially dependent on the proportions of a typeface. To achieve typeface legibility, the designer must test many typefaces in order to find the most readable ones for the design.

The primary purpose of a letterform is to convey a recognizable meaning to the mind. Therefore, letterforms must be designed with clarity, each being distinct within the alphabet. The contrast among individual characters makes it possible for the reader to decipher written information without confusion.\textsuperscript{82}
There are many typefaces, such as Baskerville and New Times Roman, that show good contrast. A legible typeface has both beautiful and functional characteristics. If the background of the signage is color, attention must be paid to the contrast between the typeface color and background color, since this will influence the legibility significantly. Color combinations with the highest contrast are the most legible. Good color combinations may be black text on a yellow background, or white text on a dark blue background. There are some guidelines that designers should follow. According to Meggs, “Appropriate contrast between type and its background requires that designers carefully weigh the three basic color properties of hue, value, and saturation.”

There are other guidelines to consider when dealing with legibility. Capital letters have less differentiation in their outer contours, making them less unique and therefore less legible. Also, the spacing between each letter, word, and line can affect legibility. Although Chinese characters are a totally different system compared to English characters, the criteria for contrast, simplicity, and proportion also could be useful for Chinese characters. For example, contrast with Chinese characters is also about color contrast between the character and its background. For the sake of simplicity, try to pick an apparent Chinese typeface that also fulfills universal design criteria. The last criterion is proportion. The considerations for the proportion of Chinese typefaces are similar to English typefaces. Chinese culture emphasizes symmetry and balance; this is also reflected in Chinese typeface design. That is why there is a good proportion between the thin stroke and the thick stroke of each Chinese character.

Other important issues affect signage legibility in wayfinding design, such as lighting and signage location. If the signage is located in a low lighting area, the signage must have a white or a light color background.
2.6.5 Clarity of Information

2.6.5.1 Clutter

According to Craig M. Berger, clutter is one of the biggest issues affecting wayfinding today, especially in hospitals. How do wayfinding designers prevent clutter problems? Following are some guidelines from Craig Berger:

1. There are two approaches to controlling clutter: putting a large amount of information on a few signs, or spreading out information among a large number of signs and print elements.

   To avoid clutter, he suggests that designers...“Reduce the number of information elements not directly related to wayfinding and identification.”84 Another helpful example is shown in the New York Health and Hospitals Corporation design guidelines, designed by Hillier, “a single sign contains building unit identification, the identification of adjacent units, and parking and transportation information.”85 This is an extremely complex sign, but Hillier Group used the principle of hierarchy on its sign layout. This was a successful solution to solve the clutter problems. Figure 20 is one example of reduced clutter based on hierarchy.

Figure 20. Coney Island Hospital, Hillier Group.
2.6.5.2 Hierarchy

One method for developing urban sign routes is called the ‘peeling the onion approach.’ This method uses a hierarchy of urban elements to help the motorist navigate to the destination without using an excessive number of sign messages. It’s necessary to provide clear hierarchy throughout a complicated sign system. The most important information is always the priority. Hierarchy is related to the principles of focal point or emphasis, which help to control where the viewer looks first. Hierarchy is achieved through emphasis, which is achieved through such things as contrast of size, contrast of color, and contrast of placement.

Hierarchy can be applied to the symbols on the signage, too. Craig M. Berger suggested that designers “…create a hierarchy of symbol information based on destination importance.” He also recommended that designers consider using color-coding to provide another level of hierarchy. Figure 21 and Figure 22 show examples of this from the USA and Japan.

Figure 21. Boston Children’s Hospital Identification Design by TwoTwelve Design Associates. Source: Universal Symbols in Health Care Workbook. (SEGD, 2006), 1:3.


Figure 21 shows the most important information in yellow, which tells users which area or building they are in. The rest of the colors convey lesser levels of information. This is
consistent with what Craig M. Berger wrote about using color-coding to provide another level of hierarchy. Figure 22 shows a similar solution used in Japan’s subway.

Hierarchy can be established in several ways. If signs are all equal in size or emphasis, the user will not know where to find the most important information. Designers should emphasize certain sign messages through type size, typestyle or background color. “Layering” the information improves the legibility of the signs, and will help visitors make their decisions faster and more accurately. 

2.6.6 Consistency

Consistency can reduce and avoid the clutter problem mentioned in the previous section on the clarity of information and resolve a chaotic wayfinding situation. In addition, consistency encompasses a very wide range of other wayfinding criteria. They include typographic font, typographic size, sign’s position, sign’s location, color, and materials. Consistency in placed design elements can include furniture and floor patterns, as shown in Figure 23. This allows signs to stand out clearly:

Consistency in the health care environment is the key to legible identification signs. Not only should unnecessary information be removed, but also the entire environment must be designed to avoid inconsistencies. All wall and floor coverings should be consistent in circulation areas. Even design elements like planters, paintings, sculptures, and donor walls can affect legibility if placed indiscriminately.
Keep in mind this does not mean a sign system should be visually consistent with the architecture and interior design of the space. In fact, if signage is too consistent with these, it could blend in and disappear. So, the wayfinding sign system must be distinguishable from the architecture and interior design of the space. “Signage that is consistent with the architecture may be attractive, but it may also be completely ineffective as communication.” In other words, this wayfinding system is not easily recognizable in the space, and many people will not notice there is an information board that can assist their navigation.

Color-coding can provide consistency. The London Underground design in 1992 is another example of color-coding consistency. Every subway line in London has a good correlation to its color-coding. For example, designers used the same blue color for the route map and for the interior seats on the blue line trains. Line identity is consistent throughout the subway system, helping riders to confirm that they are on the correct train.

2.6.7 Location

The location of the sign is crucial, because it is associated with many other wayfinding issues. For example: noticeability, visibility, and legibility of the text on the sign, and the effectiveness of the wayfinding system as a whole. Some factors
should be considered:

1. Watch out for possible lighting problems that limit legibility of signs.

2. Viewing distance must relate to your intended users. According to Miller and Lewis, “If the information is intended for a driver or pedestrian to read without stopping, the sign must be positioned so it is prominent and noticeable…”

3. Maps, or directories must be positioned in an area with no obstructions in order for the user to study it.

John Follis and Dave Hammer suggest many architectural features as possible locations for sign placement. “Some wall graphics can serve the dual function of displaying information and providing large areas of color.”

### 2.6.8 Material

Designers should select sign material carefully. Miller and Lewis discuss the importance of sign materials:

> A glossy surface on a sign can severely affect how well people with visual impairments can read it because of the increased likelihood of glare and reflections from both natural and artificial light. Signs should be produced with a matt finish, or a semi-matt finish with a gloss factor of no more than 15%.

### 2.6.9 Lighting

Lighting is also an important criteria. When dealing with lighting in wayfinding design, several problems need to be avoided.

1. Never use spotlights when you have signs with a glossy surface.

2. Never place signs directly in front of a window. In mornings or on sunny days, the sign will become non-functional because sunlight causes reading problems.

There are many different ways to light signs, such as internal lighting, external lighting, spotlighting, and ambient lighting. Each method has its pitfalls. When using a common form of internal lighting, which has an aluminum face backed up with internally
lighted acrylic, the designer should be aware that “the surface brightness of the letters should be limited; otherwise, a halo or overglow at night may distort the letterforms.”

2.6.10 Architecture

According to Passini, a wayfinding designer should not ignore the architectural concept of the setting… “Architectural elements like stairs, corridors, walls, the space defined, and the relationships among spaces provide the user with information just as signs and maps do. They are part of an information system used to solve wayfinding problems.” Indeed, many architectural elements could provide possible chances for leading users’ navigation in a space. According to Arthur and Passini, a good wayfinding design is able to help users understand the circulation system. By doing this, the designer should know how to make the best use of the architectural features that define the circulation. For example, with paths and gates:

The articulation of paths is a fundamental aspect of wayfinding communication. Proper articulation not only indicates the direction of movement and facilitates an understanding of the circulation system, it also gives users an indication of the importance of the destination and whether or not they have access to it. In this respect, paths and gates communicate similar information.

There are methods for wayfinding designers to make good use of architectural concepts by grouping spaces into destination zones. “When visiting a setting, users do not think in terms of functions, nor do they have access to a bubble diagram… Grouping is also an act of classification that helps the designer to gain an initial understanding of the setting to be planned.”
2.6.11 Security and Comfort

Most of the navigation process in the subway is underground, causing some users anxiety about security. A well-considered lighting system to assist wayfinding design also is a critical element. In addition, lighting provides a greater sense of security. According to Lawton,

...Women perceive their risk of being attacked by a stranger as significantly higher than do men, and both women and men see the likelihood of stranger attack as higher for the average woman than for the average man (Harris & Miller, 2000), ...Nevertheless, the perception of greater vulnerability for women may lead parents to restrict the wayfinding experience of their daughters more than of their sons, and may cause women to be more anxious than men about wayfinding, particularly in unfamiliar and possibly unsafe areas.¹⁰¹

Her research also explored in more detail the reason why women tend to report a higher level of anxiety than do men about performing wayfinding tasks. All these could be related to individuals’ childhood development or experience. This also relates to how people perceive and their cognitive mind. As you can see, wayfinding is heavily tied to a human’s mental image. Lynch also agreed that, “A good environmental image gives its possessor an important sense of emotional security.”¹⁰²
CHAPTER 3. METHODOLOGY

From July 18, 2005 to August 12, 2005, the author collected data and photographs in Taipei, Taiwan, concerning the use of visual aids in helping travelers find their way in the city's main subway system. The data collection included field observations and user surveys. Both documents were evaluated according to the design criteria developed by the author in the spring of 2005 in Ames, Iowa. She based these on wayfinding researchers' recommendations and her working experience for Memorial Union at Iowa State University. Each user survey took 5-8 minutes to complete, and a user survey was completed following these procedures: 1) The survey steps were explained to the volunteers, 2) The volunteers either filled out the survey themselves or the author noted their answers for them, 3) During the surveying period, the informed consent document was distributed to the volunteers.
3.1 Visual Inventory of Taipei System

Subway System

Directional Signs
-Red -Yellow
-Blue -Blue & Red
-White -Gray
-White (Transfer sign)

Orientation Signs

Identifications Signs
-Red -Yellow (Exit/Entrance)
-Blue -Others

Emergency Signs

Placement of the Signs
-Ceiling Mounted -Wall Mounted (Perpendicular)
-Wall Mounted (Flush) -Free Standing

Memory Assistants

Adjacent Sign Systems

Shopping Mall

(Taiwan Railway Administration) TRA Station
3.1.1 Subway System

3.1.1.1 Subway System: Directional: Red

Figure 24. (Danshui line) Red line close to the right lane. Photo by author.

Figure 25. Red line. Photo by author.

Figure 26. Directional sign showing various lines at platform. Photo by author.

Figure 27. Directional sign indicates downstairs platforms. Photo by author.

Figure 28. Directional sign tells user to choose the right side for the red line. Photo by author.
Subway System: Directional: Blue

Figure 29. Go straight to the Bannan Line (blue line). Photo by author.

Figure 30. Left arrow indicates Taiwan Railway Administration (TRA), but right arrow indicates one of the underground mall. Photo by author.

Figure 31. Blue line directional. Photo by author.

Figure 32. Unusual directional sign in the system. Photo by author.
Subway System: Directional: White

Figure 33. Go straight to reach blood donation room. Photo by author.

Figure 34. Public telephone directional sign. Photo by author.

Figure 35. Directional sign for two adjacent malls. Photo by author.

Figure 36. Oversize directional sign. Photo by author.

Figure 37. Directional sign mounted on pillar. Photo by author.

Figure 38. Inconsistent directional sign compared to others. Photo by author.
Figure 39. Elevator directional sign. Photo by author.

Figure 40. Directional sign close to the restroom. Photo by author.

Subway System: Directional: White (Transfer sign)

Figure 41. Directional signage mounted on pillar with complex sign layout. Photo by author.

Figure 42. Directional sign mounted on pillar with transfer information. Photo by author.

Figure 43. Upstairs is TRA transfer Area. Photo by author.
Subway System: Directional: Yellow

Figure 44. Directional sign located at the main entrance. Photo by author.

Figure 45. Directional sign combines elevator information and exit information. Photo by author.

Figure 46. Difficult arrow shape. Photo by author.

Figure 47. Different exits' information. Photo by author.

Figure 48. Sign indicating different exits. Photo by author.
Figure 49. Exits/Entrances indicator. Photo by author.

Figure 50. Directional sign using image of nearby landmark. Photo by author.

Figure 51. Temporary sign overlaid on existing sign. Photo by author.

Figure 52. Directional sign showing multiple destinations. Photo by author.
Figure 53. **Combination: directional above orientation.** Photo by author.

Figure 54. **Combination: orientation above direction.** Photo by author.

Figure 55. **Directional sign shows the exit/entrance.** Photo by author.
**Subway System: Directional: Blue & Red**

Figure 56. MRT Taipei Main Station directional sign with color-coding by showing there are blue and red route stop by this station. Photo by author.

**Subway System: Directional: Gray**

Figure 57. Restroom directional sign. Photo by author.

Figure 58. Exit/Entrance sign located at station of Minquan W. Rd. Photo by author.

Figure 59. Color coding directional sign: Yellow=exit, white=direct people to the mall. Photo by author.
3.1.1.2 Subway System: Orientation Signs

Figure 60. Combination sign of orientation and direction. Photo by author.

Figure 61. Orientation map with transfer information. Photo by author.

Figure 62 Route map with bicycle access information. Photo by author.

Figure 63 “You are Here” indicator to help users’ orientation. Photo by author.
Figure 64. Orientation map combined with cross section elevation. Photo by author.
3.1.1.3 Subway System: Identification: Red

Figure 65. Identification with transfer route located at platform. Photo by author.

Figure 66. Station identification sign on pillar. Photo by author.

Figure 67. Platform 1 identification. Photo by author.

Figure 68. Station identification sign. Photo by author.
Subway System: Identification: Blue

Figure 69. Telephone identification. Photo by author.

Figure 70. Accessible elevator. Photo by author.

Figure 71. Elevator identification sign. Photo by author.

Subway System: Identification: Yellow (Exit/Entrance)

Figure 72. Exit identification combined with bus transfer information. Photo by author.

Figure 73. Exit identification with big Arabic numbers. Photo by author.
Figure 74. Exit identification with big Arabic numbers. Photo by author.

Figure 75. Station entrance identification in context. Photo by author.

Subway System: Identification: Others

Figure 76. Detail of restroom identification, example 1. Photo by author.

Figure 77. Detail of restroom identification, example 2. Photo by author.
Figure 78. Various restroom identification. Photo by author.

Figure 79. Multiple signs gathered shows restroom’s location and using huge icons. Photo by author.
3.1.1.4 Subway System: Emergency Signs

Figure 80. Directional sign, variation 1. Photo by author.

Figure 81. Directional sign, variation 2. Photo by author.

Figure 82. Directional sign, variation 3. Photo by author.

Figure 83. Directional sign, variation 4. Photo by author.

Figure 84. Directional sign, variation 3 shown in context. Photo by author.
Figure 85. Fire fighting equipment map. Photo by author.

Figure 86. Directional sign lit from inside. Photo by author.
Figure 87. Location of emergency sign shown in context. Photo by author.

Figure 88. Detail for emergency sign. Photo by author.

Figure 89. Similar to variation 1 with a huge Chinese emergency description. Photo by author.

Figure 90. Variation 2 without English type. Photo by author.

Figure 91. Identification for emergency. Photo by author.

Figure 92. Detail of identification for emergency. Photo by author.
Figure 93. Emergency sign obscured by the commercial sign. Photo by author.

Figure 94. Safety issues illustrated and described. This poster displayed at the entrance of the station, but not in the Taipei Main Station. Photo by author.
3.1.1.5 Subway System: Placement: Ceiling Mounted

Figure 95. Directional sign with color-coding. Photo by author.

Subway System: Placement: Pillar Mounted (Flush)

Figure 96. Combination directional sign. Photo by author.
Subway System: Placement: Wall Mounted (Flush)

Figure 97. Oversized signs. Photo by author.

Figure 98. Station identity. Photo by author.

Subway System: Placement: Wall Mounted (Perpendicular)

Figure 99. Red circle indicates perpendicular sign mounted to the wall. Photo by author.

Figure 100. Directional sign indicates transfer information. Photo by author.

Subway System: Placement: Free Standing
3.1.1.6 Subway System: Memory Assistance

Figure 101. Inside of Taipei’s subway displays museum artifacts of Taipei's history. Photo by author.

Figure 102. Colorful wall of one adjacent mall (Taipei New World Shopping Center) brings users a distinct vision when they navigate though the subway. Photo by author.

Figure 103. Same adjacent mall (Taipei New World Shopping Center) has a memorable entrance. Photo by author.

Figure 104. Neon rainbow stairs captivate users’ attention; it is a very strong memory assistant. Photo by author.
3.1.2.1 Adjacent Sign Systems: Shopping Malls and Station Front Metro Mall

Adjacent Sign Systems: Shopping Malls and Station Front Metro Mall:
Directional: Green

Adjacent Sign Systems: Shopping Malls and Station Front Metro Mall:
Directional: White

Figure 105. TRA directional sign system. Photo by author.

Figure 106. Directional sign on this pillar shown cluttered with ads. Photo by author.

Figure 107. Station Front Metro mall. Photo by author.

Figure 108. Directional information on huge sign. Photo by author.
Adjacent Sign Systems: Shopping Malls and Station Front Metro Mall: Directional: Gray

Figure 109. Directional sign in Station Front Metro mall. Photo by author.

Figure 110. Telephone sign in the Station Front Metro mall. Photo by author.

Figure 111. Directional sign indicates exits. Photo by author.

Figure 112. Directional sign in between movie ads or posters. Photo by author.
Adjacent Sign Systems: Shopping Malls and Station Front Metro Mall:
Orientation: White

Figure 113. Overall exits information in Station Front metro mall. Photo by author.

Adjacent Sign Systems: Shopping Malls and Station Front Metro Mall:
Identification: Yellow

Figure 114. Exit identification and bus connection information. Photo by author.
Adjacent Sign Systems: Taipei City Mall: Directional: White

Figure 115. Exit information only in Chinese except Arabic number: toward South 12 exit. Photo by author.

Figure 116. Dressing area: toward North 11 exit. Photo by author.

Figure 117. Directional sign indicating various areas and exits with street names. Photo by author.
Adjacent Sign Systems: Taipei City Mall: Orientation: White

Figure 118. Orientation combined with directional information. Photo by author.

Figure 119. Orientation sign with “you are here” indicator. Photo by author.

Adjacent Sign Systems: Taipei City Mall: Identifications: White

Figure 120. Entrance/exit with only in Chinese except Arabic number. Photo by author.
Adjacent Sign Systems: Taipei New World Shopping Center: Directional: White

Figure 121. Directional sign with enough contrast between text and its background. Photo by author.

Adjacent Sign Systems: Taipei New World Shopping Center: Directional: Orange

Figure 122. Directional sign only in Chinese. Photo by author.
3.1.2.2 Adjacent Sign Systems: Taiwan Railway Administration (TRA): Directional: Blue

Figure 123. Typical directional sign of TRA. Photo by author.

Figure 124. Signs with outlined directional arrows. Photo by author.

Figure 125. Combination sign with direction information above orientation map. Photo by author.
Adjacent Sign Systems: Taiwan Railway Administration (TRA): Directional: Dark Brown & White

Figure 126. TRA wayfinding system. Photo by author.

Figure 127. Emergency sign with outlined arrow. Photo by author.

Figure 128. Combination sign of direction and identification. Photo by author.
Figure 129. Ambiguous color-coded sign. Photo by author.

Figure 130. Multiple signs grouped at one location. Photo by author.

Figure 131. TRA Station identification. Photo by author.

Figure 132. Exit directional sign in TRA platform. Photo by author.
Adjacent Sign Systems: Taiwan Railway Administration (TRA): Information Signs

Figure 133. TRA Passenger Train Timetable. Photo by author.
3.2 Criteria for critique of the system: (Function + Consistency)

When dealing with wayfinding issues, especially in signage design, providing a good signage system that can help people navigate easily is very important. What skills do wayfinding designers need? Understanding the nature of signs, how humans perceive them, and their importance in creating a successful environment are important considerations. So, how to critique the existing Main Station of Taipei’s MRT subway system? Therefore, to answer all these questions, a qualitative method was used. A qualitative method will help the author to obtain better quality results with greater depth for this study. Additionally, a quantitatively analyzed survey also was used to ensure the validity of the author’s thoughts throughout this study. Before listing all of the criteria, Taipei’s MRT subway system must be introduced first.

Taipei’s MRT started on March 28, 1996. At that time, more than 200 thousand people rode the subway to work. At the end of 2002, the passenger population had exceeded 910 thousand. This rapid growth of passengers proved that Taipei’s MRT is a very important mode of transportation in peoples’ daily lives. The MRT system includes 33 subway stations and four underground shopping malls. The Taipei MRT has three names: MRT, TRTC, and TRTS. Why focus this research on only one subway station, Taipei Main Station? The answer is that Taipei Main Station is the most complex subway station in the MRT because it is connected to the TRA (Taipei’s train station) and four underground shopping malls. Taipei Main station is located at the center of the downtown. It would be very beneficial to have clear legibility and readability throughout its wayfinding system. Not only would it save time for all passengers, but it also would demonstrate a considerable respect for foreigners who work in or visit Taipei.

Generally speaking, the existing wayfinding system in the Main Station of Taipei’s MRT subway is really complicated. This research included two processes during the early data gathering. The first process involved field investigations, and the second process
involved conducting user survey with 100 participants. Before visiting the site, the author seldom paid attention to English when she had Chinese to read. One problem with using dual languages is that Chinese and English letters are totally different in terms of visual impact. As mentioned in an earlier section of this thesis, a Chinese letter is squarer and heavier, whereas an English letter is more fluid and simple. However, after visiting the site, the author found the major wayfinding problem was *not* the dual language. This is because most users are Chinese readers, and most non-Chinese readers are able to read the English text.

Although the subway system implemented color-coding in its signage, the use of color-coding was very problematic. The sign colors are roughly organized by category. For example, white always shows pictogram information and transfer information, while the colors red and blue show route information. The third color, yellow, shows exit or entrance information. The fourth color, green, shows emergency information. After analyzing the data from the field investigation, one striking observation was that the subway system has more than three colors. It is not a simple four-color system in general because the subway at Taipei Main Station connects to different shopping malls, and a train station. These connections make the original system much more complicated.

### 3.2.1 Universal Design

Accessible design is the result of careful consideration of many factors. A handy universal design resource for providing important criteria is the book *Access for Everyone*. This book covers most minimum requirements, along with newly developed recommendations to accommodate different people’s needs. “Universal design is design for all people regardless of variations in ability.”[^103] Here are the general key points for universal designs according to *Access for Everyone*,

> Signs provide important information about locations and services,
including information about accessible locations and services. All people should have access to all types of information provided by signs. To assist the greatest number of people, signs should be placed (in or at) appropriate locations and heights, contain characters and backgrounds that meet specific requirements for readability, and use symbols that have been adopted internationally to indicate accessible locations and features.104

Both Access for Everyone, ADAAG (Americans with Disabilities Act Accessibility Guidelines) and the White Paper which the Society for Environmental Graphic Design (SEGD) wrote in response to the Americans with Disabilities Act (ADA)105 provide helpful criteria for critiquing wayfinding signage. In addition, the ADA also provides several important principles for evaluating the accessibility of signage, directories, and egress. These are included in the following criteria that are based on the Arabic alphabet because there are no regulations or specific standards established for Asian typography.

3.3 Criteria Used in the Evaluation of Taipei’s Wayfinding Signs:

The following visual communication criteria are adopted from previous professional studies, as well as from universal design criteria adopted from the SEGD Americans With Disabilities Act (ADA) White Paper.

3.3.1 Typography

Based on graphic design recommendations for wayfinding signs, typography issues should be the highest priority concern. A sign with carefully considered typography will assist legibility. The following questions focus on the evaluation of character height, character considerations, and character spacing.

3.3.1.1 Character height:

1. Is information on the signs legible to viewers? There are specific guidelines for the relationship between the mounting height and the size of the characters on signs. Higher mounting heights require larger characters.
3.3.1.2 Character considerations:

1. Does the sign use a combination of uppercase and lowercase?
2. Does the sign use sans serif typefaces for easy recognition? A sans serif typefaces better serves universal design.
3. Does the sign have a clear distinct ratio between width & height? In other words, is the stroke thickness of the uppercase letter I between 10% and 30% of the height of the character, as shown in Figure 134.

\[ x = 10\% \text{ min to } 30\% \text{ max of } y \]

Figure 134. Recommended ratio between width and height. Illustrated by author.

4. Does the sign have enough contrast between the characters and the background?

3.3.1.3 Character spacing considerations:

1. Is the space between an individual character between 10% and 35% of the character height? For optical consistency, the spacing between I and P will be greater than the P and B.
3.3.2 Clarity of Information

1. Does the sign have too much information, or are too many signs grouped together?

2. Is there a terminology problem?

3. Are there any legibility problems (special emphasis on the dual language signs)? Are the signs hard to read because of the type color and background color or because of the type size?

4. Do arrows indicate clear directions? For example: front, right, left, upstairs, downstairs.

5. Does each platform or station design directly show people a distinct identity, so people would realize that they are in certain station?

6. Do maps provide enough information, but not so much as to be difficult to view quickly?

3.3.3 Consistency

1. Is color-coding used for directional signs?

2. Are all signs at a consistent height or location?
3. Do all signs have a consistent typography?
4. Does the wayfinding sign system have consistent lighting?
5. Does the wayfinding sign system use a consistent material?
6. Does the wayfinding system have a consistent and distinct quality for safety signs?

3.3.4 Location
The first concern is that signage needs to be located at the decision points, and should be easy to see.
1. Is the signage too high or too low (above or below the cone of vision)?
2. Can people easily recognize the sign or does it take them a long time to find the sign’s location?
3. Is the sign equally noticeable when people are sitting or standing on the train?
4. Is a directional sign located at the decision point?

3.3.5 Material
Are signage surfaces too glossy?

3.3.6 Lighting
1. Is the lighting bright enough to assist signage legibility problems?
2. Does the lighting emphasize the site’s features, and guide people to the decision points?
3. Is there too much distraction from lighting in the subway building?
4. Are any signs placed directly in front of a window so that sunlight will make the sign difficult to read?

3.3.7 Architecture
1. Is there too much color from architectural details or advertisements?
2. Are there landmarks to assist in the users’ cognitive mapping?
3.3.8 Safety Issue

1. Do all emergency signs have a distinct appearance compared to other signs?
2. Are they prominently located?

3.4 Field Observation

Once the criteria were established, it was necessary to perform the above evaluation during the on-site observation process. The key was observing not only the effectiveness of signs, but also the function of signs. In other words, how people use those signs. There are three major evaluation methods that should be considered while planning for the on-site observation: 1) Analysis based on existing codes and standards, 2) User analysis, and 3) Analysis of systems in other cities and places. In addition, questions of effectiveness were kept in mind throughout the field observation; they can be grouped in the following categories:

1. Effectiveness of color-coding of routes
2. Effectiveness of the placement of signs and maps
3. Effectiveness of dual language use on signs
4. Effectiveness of the information hierarchy
5. Effectiveness of the consistency of approach

The following are details about how the field observation was conducted:

1. Request people to fill out questionnaire about the site’s wayfinding system.
2. Go to the site during morning and evening, since there will be differences between day and night.
3. Observe people at different locations to see which locations cause more wayfinding problems.
4. Observe people at decision points or major circulation points. Are people using signs often? Do they seem to know where to look?

5. Decision Point analysis:
   a. How many possible routes can the user choose?
   b. What kinds of signs are used? Do they use overhead ceiling mounted or flush mounted on the wall?
CHAPTER 4. FINDINGS

4.1 Critical Assessment of the System

4.1.1 Universal Design

Throughout this complicated system, there are positive observations that can be made. For example, (1) In each platform, there is a yellow painted edge that makes the platform more accessible for everyone. According to Pedestrian and Bicycle Information Center (PBIC), “Federal regulations require design treatments such as station elevators and tactile strips along platform edges (to allow visually-impaired riders who use canes to detect the edge of a platform).”  107 (2) The entrance signage uses the big Arabic numbering system instead of the Chinese numbering system, which shows consideration for foreign users and all users of the system; see Figure 136. (3) The “you are here” orientation maps do a good job in terms of their size and representation. These also show respect for all user groups; see Figure 137 and 138. (4) Emergency or safety signs are everywhere, which will provide enough assistance anywhere an accident occurs. In agreement with Romedi Passini suggestions about emergency conditions, the Taipei subway system encourages entrances/exits to serve both functions. By doing this, users can rely on their familiar cognitive map when there is a fire emergency.
Figure 136. Large Arabic number used in consideration for all users. Photo by author.
Figure 137. Huge orientation for overall subway route with "you are here". Photo by author.
Figure 138. Route map indicating bicycle access. Photo by author.
In addition, the Taipei subway pays respect to international users by providing a wide range of translated brochures in front of the entrance or information desk. There are Mandarin, Japanese, English, French, Vietnam, and Thai. Although the Taipei Subway provides paper maps of the same information in Figure 137 and 138 that are easy for users to carry, the user will be more confident in navigating through this complicated underground if the whole wayfinding system clearly shows users the way.

There are many negative observations, however, that can be made throughout this system. The following sections provide a detailed description of these critical observations with accompanying images.

4.1.2 Typography

In previous studies, it was suggested to use a sans serif typefaces wherever possible. As you can see from many examples of signage throughout the Taipei subway system, most signs used Helvetica and Folio typefaces, which are recognizable sans serif typefaces. But the Taipei subway system also uses the Times New Roman typeface on their temporary signs; this is the only serif typeface they use. The recommended typeface solution will be that all signs consistently use sans serif to serve users with easier recognition. In addition, sign designers should avoid the use of all caps in order to avoid creating more legibility problems. (See Figure 140)
Leading needs to have enough spacing to help legibility. The existing sign in Figure 141 has tight leading (shown as a); this can be compared to the wide leading in Figure 142 (shown as b). The leading spacing between letters in Figure 141 is too narrow, and it will cause more legibility problems. A better spacing between Chinese characters in Figure 142 gives users clearer legibility.
Figures 143 and 144 show much better design solutions. They show nice legibility. Figure 145 gives a clear example of the use of yellow text on the gray color background. This use of color creates legibility issues. Some people who have visual impairments may find reading certain information difficult if the sign is located in a low lighting environment. Even if the signage is located at the correct location, if there is a lighting problem, there will be a legibility problem.
4.1.3 Clarity of Information

Figure 146 is an example of cluttered signage. It is possible to incorporate the elevator signage into the transfer sign’s box because of the empty space. This change would result in a simpler looking sign.

The clarity of existing arrows is problematic. Arrow design must be simple and clear in conveying information. The arrows throughout the whole subway system are too complicated and decorative. See the comparison between the existing arrow design, Figure 147, and the recommended arrow designs in Figure 148. In addition, an arrow’s proportion could also affect legibility. Normally, the vertical stroke for the arrow’s shaft is longer than the arrowhead. The longer shaft helps the user to recognize where the arrow is pointing.
Another issue is icon use. Why use same icon for several different services? For example: Information desk 1, 2, 3 and the Passenger Service Center all use the same icon as shown in Figure 149 and Figure 150. The multiple use made some people confused.

Most of the signs did not indicate the current floor or level as seen in Figure 151. For example, if a user on 1st floor sees a directional sign, that sign should have a 1st floor identifier on the top of the sign; see Parson’s design for the Memorial Union at Iowa State University in Figure 152. It not only indicates the floor, but it also adds color-coding to assist the user’s memory. If signs do not indicate location in this manner, the user will easily get lost.
Figure 151. Sign lacks a floor identity at the top of blue area. Photo by author.

Figure 152. Floor indicator is reinforced by color-coding. Photo by author.

Figure 153 shows the arrow’s color should use a more neutral color not related to specific colors in other parts of the sign. Otherwise, some people might think the arrow is only for the information in the yellow color, not for the information in the white color. For example, the toilet signage has a white background with blue arrows. It will confuse first time users who may think it relates to the blue line only; in other words, that the toilet is in the blue line’s area.

Figure 153. Toilet directional sign caused perception confusion. Photo by author.
Notice the blue and red sign in Figure 154. Instead of pointing up, the arrow should be pointing down, because the MRT Taipei Main Station is located below the viewer. A visitor can ride the escalator or walk down stairs to MRT Taipei Main Station. Although according to previous studies, any directional signage above eye level can use either an up arrow or a down arrow to indicate straight ahead, the recommendation here is that using a ‘down’ arrow is much more suitable than an ‘up’ arrow, since the down escalator is very close to the sign. When you notice the sign, you are already just one or two steps away from the down escalator. So why confuse visitors by giving them an arrow that points in the wrong direction?

Figure 154. A downward movement is shown with an upward arrow. Photo by author.

4.1.4 Information Arrangement and Quantity

This is also a problematic category in the existing wayfinding system for Taipei’s subway. First, Figure 155 is a combinational sign containing emergency and general information. This was a good decision because it can reduce clutter problems. Users will also get more used to always being reminded about where they can find an emergency exit when they try to find their destination. In addition, it will make the whole wayfinding system more consistent and clean. But for this kind of combinational sign is the emergency
information should have a more distinct appearance compared to the rest of the signs. This will help users recognize the emergency information when there really is an emergency.

![Figure 155. Incorporate emergency sign as general combination. Photo by author.](image)

Other problems are shown in Figures 156 –158. These include the following: 1) different arrangements between three colors, 2) too many arrows, 3) inconsistent information presentation. For Figure 156 and Figure 157, problem 1 is obvious. Information in the same color should be grouped together instead of separated into two pieces. In addition, the color order should be consistent. The designers should try to keep the same order as blue, yellow and white as in other color arrangements. In Figure 156, problem 3 occurs with the yellow sign in that it sometimes has the full name with number, but sometimes it does not have both pieces of information. The recommended solution is to use only one format to represent information on the sign.

![Figure 156. Combination sign 1: Includes problems 1 and 3. Photo by author.](image)

![Figure 157. Combination sign 2: Includes problems 1. Photo by author.](image)
The recommendation for problem 2 will be reduce the arrow’s quantity. If those destinations have the same direction, one arrow is enough.

![Figure 158. Combination sign 4: Problem 2. Photo by author.](image)

Figure 159 also shows inconsistency in signage location and in its information arrangement. Since this is one of the major decision points that will cause many problems for users in finding their way, the recommendation is to combine information together and reduce the number of signs.

![Figure 159. Inconsistent directional signs everywhere, resulting in a cluttered message. Photo by author.](image)

A better design solution is shown in Figures 160-162 from Alan Parsons’s wayfinding design for the Memorial Union located at Iowa State University. It provides most important areas in one sign that users may need to know at this decision point. This consistent arrangement solves the cluttered problem seen in Figure 159. At the same time, it can save users’ reading time when they try to scan though various signage in the Taipei subway system. The advantage of the Memorial Union’s sign is that it is efficient and convenient for users when
they walk through that area. Users can stand at one location, and pick up the right
destination or direction they want to go without circling around to read multiple signs.
4.1.5 Alignment and Grouping

Figure 163 shows a better design solution based on alignment and grouping on a sign from the Chicago subway system. The information has consistent alignment, which improves readability and legibility.

Figure 163. Chicago Transit Authority (CTA) “T” Station with all type aligning on the same axis. Photo by author.

Figure 164 shows a lack of alignment in an existing adjacent mall’s wayfinding system in the Taipei subway system. This causes difficulty in the readability when users perceive this sign. An improved design solution is proposed in Figure 165.
The first step in reducing clutter is to group similar information, and then to reduce unnecessary arrows to create a more clear and clean design layout. Then, you must consider if your message on the sign is readable to your audience. In other words, is it legible?

The second step is clarity. Figure 164 has too much cluttered information. Clarity can be achieved through information hierarchy. A good hierarchy emphasizes the most important information. There are many ways to lead your users to the most important information, such as creating a focal point or other visual cues. In addition, you can also call attention to information by using contrast in type size or color.

Another design solution is suggested in Figure 167, which uses clarity and a good information hierarchy through improved organization.
An improved alignment and grouping of the information can help users find their way easier and faster. The sign in Figure 166 feels confusing and cluttered; the proposed design solution in Figure 167 aligns the symbols on outer edges. This is also much more pleasant visually.

4.1.6 Symbols

Another problem of these existing signs is their symbols, as shown in Figure 168. Symbols should play the role of assisting memory in a wayfinding system. So when symbols are used on signage, they need to have strong line weight and negative/positive space. When a commercial logo is included among the navigation symbols, it may not have been designed
with visual clarity in mind. The logo circled in red has poor line weight. It loses its visual impact compared to other symbols on the sign, making it less effective for assisting user navigation. If necessary, existing logos should be revised to use adequate visual weight, as shown in Figure 169.

Figure 168. Red circle indicates poor existing logo design. Photo by author.

Figure 169. Proposed design solution improves logo by contrasting its line weights and simplifying the logo. Photo by author.

4.1.7 Consistency

This is a very important criterion for evaluating a wayfinding system. That is why it has been divided into two categories to have a more detailed explanation: Terminology and Typeface.

4.1.7.1 Terminology Consistency

Metro Taipei’s system is currently operated by the Taipei Rapid Transit Corporation (TRTC). Although TRTS stands for Taipei Rapid Transit System, TRTS means nothing to a visitor who is familiar with only one of the subway terms for Taipei. This is an example of inconsistent use of terms. Inconsistent terms should be changed to MRT, which is familiar to most users. Actually, there is an explanation on the web that says “TRTS=Taipei
MRT=TRTC.” A general user may not know this information unless they find it on the Internet or ask people who are familiar with those terms.

Figure 170. TRTS directional sign of accessibility route. Photo by author.

Figure 171 is another example of terminology inconsistency. *Station Underground Mall* is the same as *Station Front Metro Mall*, as it is called on the subway wayfinding system. These inconsistent terms will confuse users when they try to find the mall. Especially for the first time user, how could they know these different names actually mean the same mall?

Figure 171. Inconsistent terminology on a brochure’s map. Source: Taipei Rapid Transit Corporation.

4.1.7.2 Typeface Consistency

While there are many different kinds of typefaces, a successful wayfinding system needs to use typefaces consistently. During the field observation of the existing subway system, it was found to have more than two typefaces. They are Helvetica, Folio, and Times New Roman. Even with the Chinese typefaces, there are too many varieties, as shown in Figures 172-174. In order to help users save time when they read signs, try to use the fewest numbers of typefaces as possible. This results in a cleaner looking sign.
In addition, the existing wayfinding system in the Taipei subway frequently uses too many type sizes in one sign. Figure 175 shows a really uncomfortable looking sign. A recommendation will be to limit the type sizes in one sign, especially one that already has too much information on it. For example, the combinational sign already looks complicated because of color-coding and icons. Although sometimes typeface size might be influenced by the display space, it should have a more consistent template throughout the entire system. This way can help users perceive the sign’s information easier.
4.1.7.3 System Consistency

Figures 176 and 177 show how the MRT signage system is not clear, even though there are three major categories. It is still messy because information is sometimes combined onto one panel, and sometimes separated into two panels. This is shown in the comparison of Figure 176 and 177. In Figure 177, there is a blank hanging sign of exactly the same type behind the existing hanging sign. Why are these so different?

![Figure 176. Common combination ceiling over-hanging sign. Photo by author.](image)

![Figure 177. Red arrow indicating the same type of sign as in Figure 176. Photo by author.](image)

Another problem with inconsistency is the color-coding throughout the Taipei subway system. As shown in Figures 178 and 179, these two signs of different colors point to the same destination in the Taipei subway system. It definitely confused users, because white usually stands for transfer information or service information. Yellow stands for exit information. Ironically, the colors used on Shinkong Mitsukoshi Dept. Store stand for ‘Exit Information’ in the subway. While considering color-coding in wayfinding design, this kind of error could easily be prevented.
A good color-coding system has a consistent usage throughout the whole system, even showing in the platform’s identity. See Chicago’s subway (CTA) in Figure 180, where the color-coding system is even carried out in its pillars on the station’s platform.

4.1.7.4 Location Consistency

Keeping a consistency of location throughout wayfinding system is very important because it can help users quickly become familiar with the system and easily find the information they need during their navigation process. Figures 181-183 show there is no consistency in the signage location throughout the Taipai subway system.
4.1.8 Location

Some of the signage is too high, or on a pillar, or too low. In Figure 184, you can see a poor location for the sign directing users to the 7-Eleven retail store. This sign’s location is very easily blocked during rush hour, or if someone is just standing there. People who need to see this sign will be not able to see it; therefore, this sign is not functional.
Figure 185 is another example of a poor or incorrect location. Is the arrow leading you to the wall? As you can see in this image, there is no entrance to the restroom in the direction indicated by the arrow. The recommendation is to move this sign back so that it is located at the center of the entrance to the restroom.

![Figure 185. Incorrect arrow placement. Photo by author.](image)

Figure 186 and Figure 187 show signage located in obscure locations between the huge advertisement displays.

![Figure 186. Obscure sign location between huge ad displays. Photo by author.](image)
Figure 187. Hard to notice sign’s location between two ad displays. Photo by author.

Figure 188 shows elevator signs in unrecognizable locations. It would take the user a long time to figure out the elevator’s location from these signs. Compared to Figure 189, you can see how poorly the Taipei subway system has indicated the elevator location. When there are many people in front of the elevator, can you still easily notice there is an elevator behind the crowded people? Figure 189 shows a much more visible location for such a sign. In addition, there should be a combination of typography and icons to accommodate the needs of both locals and internationals. Bureau Mijksenaar’s design in Figure 189 really assists users during the busy hours and regular hours.
Figure 188. Red circles indicate elevator signs in an obscure location. Photo by author.

Figure 189. Elevator sign in second avenue subway at New York city. Designed by Calori & Vanden-Eynden (C&VE). Source: SEGD-EGD in Transportation, Train Station, Airports, Transit Hubs Workshop November 12, 2004 CD.
Another example of a bad sign location in the existing subway system in Taipei is shown in Figure 190. Figure 191 presents a recommendation for more prominent locations for signs within the system.

![Figure 190. Existing sign with a recommendation for a better location for the sign. Photo by author.](image)

![Figure 191. Proposed overhead sign, using both sides of the sign panel. Designed by author.](image)
This proposed overhead signage is still visible even in rush hours, whereas a crowd will cover the existing signage (Figure 190) during rush hours. In addition, this type of signage can be seen on both sides. People coming from downstairs can easily see what exits and offices are located on this floor; people coming from upstairs can do the same. This kind of design will be very useful in similar conditions throughout the wayfinding system. As recommended by ADA, these proposed signs are at least 80 inches from ground to the bottom of the sign. Finally, on each directional sign it will be better to indicate which floor the users are on. Doing this will help people orient themselves easily, even when they get lost.

4.1.9 Lighting

In Figure 192, the light from inside emergency signs is too weak. If there really is an emergency, this low lighting will make this sign difficult to see. Another lighting recommendation for figure 193 is to never use spotlights when a sign has a glossy surface. The type at the right of the Arabic number 3 has totally disappeared, as well as the arrow.

4.1.10 Architectural and Material Considerations

The lighting and architecture do not really emphasise site features and guide people to decision points. Also there is too much lighting that distracts the viewer, which makes it difficult to read signs. These problems are shown in Figures 194-196.
The sign material is too glossy on some of the directional or exit signs, such as in Figure 197. Matte surfaces will reduce problems with light reflection.
4.1.11 Safety

Most emergency signs are big enough to notice, but as can be seen in Figure 198, a few are too small. Another problem with this sign is that it is too far away from the universal design concept. Users will not be familiar with this kind of emergency sign. Usually, a green running man will be more familiar to international users. A better solution for emergency exit signs is shown in Thailand’s subway in Figure 199. The green signs indicate both emergency and exit numbers. This is consistent with Paul Arthur’s recommendation of getting people to associate ‘exits’ with ‘emergency exits.’

![Figure 198. Too small emergency sign, and it is not a universal emergency signage. Photo by author.](image)

![Figure 199. Thailand subway exit sign. Photo by Platt A Supimol W'Dunrong.](image)
4.2 Survey Results

As an earlier section of this thesis explained, this research used two processes for data gathering. The first process included the field investigations, and the second process was in conducting user survey with 100 participants. The purpose of user survey was to find out what possible problems might confuse visitors finding their way in Taipei’s subway. By identifying the problems, some suggestions for future improvement could be presented. During the survey process, the principal investigator took notes concerning the answers given on the questionnaires. In addition, consent document forms were distributed to the participants when they volunteered to participate in this study. The survey was conducted in Taipei, and the data was analyzed in Ames, Iowa, using the Static Package for Social Science (SPSS) program. Finally, the data analysis results were as follows:

4.2.1 User Profile:

One hundred people were surveyed: 50 males and 50 females. Among the Taiwanese participants, nine of the 50 males and six of the 50 females were under 18 years old, meaning that 85% were adults, including both the Taiwanese and foreigners. Concerning the foreigners, ten were males and six were females older than 18 years. In other words, the majority of the users were adults from Taiwan. Table 2 shows the demographic data.

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
<th>Total numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Foreigners</td>
<td>Taiwanese</td>
<td>Foreigners</td>
</tr>
<tr>
<td>Above 18 yrs</td>
<td>10</td>
<td>31</td>
<td>6</td>
</tr>
<tr>
<td>Under 18 yrs</td>
<td>0</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Total Participants</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>
Overall, about 70% of the participants answered that they use the Taipei subway system daily or occasionally. Forty percent of the males use the Taipei subway system daily or occasionally and 71% of the females use the Taipei subway system daily or occasionally (Table 3).

Table 3. Number of overall participants divided by frequency of usage

<table>
<thead>
<tr>
<th>Overall Participants</th>
<th>Males</th>
<th>Females</th>
<th>Total numbers=90</th>
<th>Total percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>F</td>
<td>Unf</td>
<td>F</td>
<td>Unf</td>
</tr>
<tr>
<td></td>
<td>69%</td>
<td>31%</td>
<td>71%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Overall includes Taiwanese and Foreigners
Unf=Unfamiliar = First time user + Couple of times
F=Familiar =Daily + Occasionally
Total numbers= Including males and females

The total number of foreigners using the subway system was 16 out of 100 (Table 2). Although 90% of the male foreigners use the subway daily or occasionally, there were still up to 50% of the males who agreed that the Taipei Main Station had the most wayfinding problems (Table 4).

Table 4. Number of foreign participants divided by their frequency of usage

<table>
<thead>
<tr>
<th>Foreigners</th>
<th>Males</th>
<th>Females</th>
<th>Total numbers=16</th>
<th>Total percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Familiar</td>
<td>90%</td>
<td>50%</td>
<td>12</td>
<td>75%</td>
</tr>
<tr>
<td>Unfamiliar</td>
<td>10%</td>
<td>50%</td>
<td>4</td>
<td>25%</td>
</tr>
<tr>
<td>Taipei Main Station has most wayfinding problems</td>
<td>50%</td>
<td>66%</td>
<td>9</td>
<td>56%</td>
</tr>
</tbody>
</table>

Unfamiliar= First time user + Couple of times
Familiar=Daily + Occasionally

According to the Society for Environmental Graphic Design (SEGD) conference in Chicago in 2006, some wayfinding specialists strongly agree that the wayfinding professional field should put much emphasis on visitors being able to navigate their way properly through signage, although signage is important to both local people and visitors. In other words,
serving first time users should be one of the key goals when designers deal with a wayfinding design. Table 5 shows the tabulation of the responses of first-time Taiwanese users.

Table 5. First time Taiwanese users

<table>
<thead>
<tr>
<th>First time user (Taiwanese)</th>
<th>Males</th>
<th>Females</th>
<th>Total numbers=10</th>
<th>Total percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not knowing where to look for information</td>
<td>40%</td>
<td>40%</td>
<td>4</td>
<td>40%</td>
</tr>
<tr>
<td>Confused about where I am</td>
<td>20%</td>
<td>40%</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>Agree that directional signs are big enough to notice</td>
<td>75%</td>
<td>100%</td>
<td>8</td>
<td>99%</td>
</tr>
<tr>
<td>English type size not big enough</td>
<td>20%</td>
<td>20%</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Good legibility of the words on signage</td>
<td>100%</td>
<td>80%</td>
<td>9</td>
<td>90%</td>
</tr>
<tr>
<td>Taipei Main Station has most wayfinding problems</td>
<td>80%</td>
<td>60%</td>
<td>7</td>
<td>70%</td>
</tr>
</tbody>
</table>

During this study, there were few foreign participators who were first time users, so only the results from Taiwanese first-time users are provided here. The survey consisted of 14 questions. Table 5 shows only the most significant questions out of the fourteen. Both the Taiwanese males and females had no problems with the size of the directional signage, saying it was big enough to be noticed. However, up to 40% of the females felt it was easy to get confused about where they were. The percentage was lower in males. Below is a comparison graph of genders from the above tabulation:
Figure 200. Gender comparison graph of first time Taiwanese users. Illustrated by author.

Although “good legibility of the words on signage” and “directional signs big enough to be noticed” had been identified as adequate for Taiwanese users, Figure 200 shows that males and females are quite different in some answers. Finally, the result pattern indicated high agreement that the Taipei Main Station has the most wayfinding problems for both Taiwanese genders.

The results from daily users and familiar users, both Taiwanese and foreigners, can be seen in Table 6. The daily and familiar user group shows that up to 73% of the users are sometimes confused about the wayfinding system, and 40% are often confused.
Table 6. Daily and familiar users

<table>
<thead>
<tr>
<th>Overall daily and familiar users</th>
<th>Males</th>
<th>Females</th>
<th>Total numbers=29</th>
<th>Total percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Often confused</td>
<td>40%</td>
<td>0%</td>
<td>5</td>
<td>20%</td>
</tr>
<tr>
<td>Sometimes confused</td>
<td>40%</td>
<td>33%</td>
<td>10</td>
<td>34%</td>
</tr>
<tr>
<td>Never</td>
<td>20%</td>
<td>67%</td>
<td>14</td>
<td>50%</td>
</tr>
</tbody>
</table>

4.2.2 Summary

Additional questions were asked about the effectiveness of the signs. The results showed that most participants thought the ceiling hung signage was at a good height, especially for directional signs; yet interestingly, they considered these signs only somewhat helpful. The most successful signage was the parallel wall-mounted orientation or directional signage. Users of both genders agreed these signs were at a good height, and assisted them by providing very helpful information while they were trying to find their way in Taipei’s subway. Most participants had no problem with dual language signage, especially with the size of the English words, although the males found them more successful than did the females. This would be not very fair to make a conclusion based on the survey result, because most users were Taiwanese. They barely read English on the wayfinding signs.

Looking at the overall population again, there were 72% of the males who understood the existing icons throughout the whole system. For the females, 68% understood the icons. In addition, 98% of the males and 96% of the females thought the words on the sign were easy to read. Finally, most participants had no problem finding the entrances, and most agreed that each entrance was clearly marked. Still, a higher number of females than males answered that the entrances were not clearly marked. This correlates to research on gender differences; that females differ from males in their perceptions and their strategies for navigating through a space.
This survey result shows interesting differences in some questions.

**Disagreement based on genders:**

Most participants of both genders had no problems with entrances; most agreed that each entrance was clearly marked. But there were still higher numbers of females who answered that entrances were not clearly marked than did males.

Males were more concerned than females about the size of directional signage. Females were less sensitive about size of the words on signs; they found the words on the signs legible compared to the males. This disagrees with Table 4, where it said that 100% of the males agreed there was a good legibility of the words on signage. But there were only 80% of the females who agreed that there was a good legibility of the words on signage.

### 4.2.3 Recommendations based on Survey Results

**Survey Result 1:** Men and women have different reasons for becoming confused about finding their way: most men tend to not know where to look for information, while most women felt like they had too many choices.

**Recommendation:** Consistency about signage location is very important. In addition, try to focus on only necessary information at a decision point, being careful to avoid information overload.

**Survey Result 2:** If people had to transfer to another color route/line, often they had problems once they left the platform because the signage did not provide any assistance for them. They would find themselves outside of the subway, and then they would have to pay again to get in so they could transfer to the other color line in the MRT station.

**Recommendation:** Try to provide informational signage about transfer locations inside the turnstile.
Final overall recommendation: As a wayfinding designer, you must get familiar with the whole site during the planning process. Try to test the prototype signage at possible locations for almost two to three weeks before permanently installing the sign in that location. Doing this testing can show if the signage is effective in assisting users.
CHAPTER 5. CONCLUSIONS

Knowing how to communicate efficiently to users is the responsibility of a graphic designer, especially in the wayfinding field. “We select certain things to look at. And what we decide to see is determined by what we know and what we believe and what we want.”¹⁰⁸ This also can be explained as our perception. We get used to perceiving certain objects, and also have a habit of ignoring other objects. All of these are derived from our culture. Each individual has been brought up in a different way, but similar cultural backgrounds will result in similar perceptions. So a well-considered wayfinding system must be based on a common knowledge and habits that exist across cultures, with an emphasis on designing for all people. For example, using universal symbols in a wayfinding system can communicate faster and more effectively in an international city like Taipei. Meanwhile, wayfinding designers still have to consider the population comprising the majority of the user group. For example, Taipei’s subway has a majority of local Taiwanese; therefore the Taipei’s subway wayfinding system must be designed based on a local common ground. This is also why a subway’s wayfinding system is different from an airport’s wayfinding system.

Wayfinding involves a broad range of other disciplines, including the study of semiotics, which may be influenced by gender differences, social group differences, and cultural differences. Since wayfinding design also uses many signs, symbols, and pictograms, a wayfinding designer should be familiar with semiotics in order to design a successful wayfinding system.

Since the wayfinding process is involved with memory and learning, a well-planned system would reinforce the user’s memory while they navigate through subway. Like Lynch’s evaluation theory for cities, a wayfinding system includes paths, edges, districts, nodes, and landmarks, which can be used in evaluation. In addition, the author developed a list of evaluation criteria: universal design, color, navigational aids, location, typographic
concepts, legibility, clarity of information, material, lighting, architecture, consistency, and safety. The analysis of the existing Taipei signage system was based on a range of visual communication criteria adopted from previous professional studies and on the universal design criteria adopted from the Americans With Disabilities Act (ADA). Following is a synopsis of the recommended design criteria to help evaluate any wayfinding system:

**Universal design:** People who have learning difficulty will gain more benefits from pictures and symbols on signage. Also users with poor vision need large type that has good contrast from the background.

**Color:** Although color-coding can assist people to navigate faster, it still has some limitations. People can remember no more than 5 colors. Red is usually associated with emergency, so it should not be casually used for any subway route. London’s subway uses color-coding successfully by keeping it consistent throughout the system. For example, they use same color-coding even in their seats. Everything is a complete set. Another successful example of using color is the subway in Thailand. They have a green color sign showing both emergency and exit numbers.

**Navigational aids:** 1) Directional sign-Make sure the arrow placement is correct. 2) Identification sign-Must be distinguishable from the rest of the signs. 3) Orientation sign (Map)-A clear visualization of landmarks and the identification of the user’s location in connection with the townscape above ground are two important basic elements in map design, especially in a subway’s wayfinding system.

**Location:** Consider the height of the signs. Viewing distance must relate to your intended users. Watch out for lighting problems that prevent legibility of signs. Most important is to locate signs at the decision points.
**Clear typography:** When using English characters, avoid use of all upper case letters when your sign has more than two or three words. In addition, the character height, proportion, and spacing should be carefully considered.

**Legibility:** The spacing between each letter, word, and line can affect legibility. Consideration of the quality of contrast, simplicity, and proportion on a sign also can help to achieve legibility.

**Clarity of information:** Watch out for information overload. Prevent clutter by reducing the number of information elements not directly related to wayfinding and identification. Also use the principle of *hierarchy* to provide users with a clearer presentation of information.

**Material:** Glossy surfaces can cause glare on signs, reducing their legibility. Matt finish or a semi-matt finish will be better.

**Lighting:** Investigate if there are any spotlights with a glossy surface. Never place a sign directly in front of any window, because the sunlight will cause legibility problems. In addition, avoid placing signs too near a source of distracting lighting, because it will affect legibility.

**Architecture:** Make the best use of the architectural features. Wayfinding designers should help users to group spaces into destination zones. Make the best use of *landmarks* to help users memorize a space.

**Consistency:** Typographic font, typographic size, the sign’s position, the sign’s location, color, and materials all should be coordinated in order to have a consistent system. In addition, the furniture and floor patterns could be incorporated to reinforce consistency.

**Safety:** Signs that identify safety or emergency information must have a distinctive appearance compared to the rest of the signs. This will ensure that they are seen.
After learning many wayfinding theories, studying research, and developing the criteria above, and author returned to Taipei to evaluate the subway’s wayfinding system. During the field investigation, the first thing a designer should do is to analyze the existing directional signage and the directories, to evaluate if the signs are functioning well. The most confusing areas are usually at the decision points. Therefore, providing clear directional signage located at the decision point will be important. Meanwhile, the author conducted testing with 100 participants during the field investigation. Although the questionnaire summaries did not always agree with the field observation, this comparison still provided helpful support for this study.

Ultimately, several important recommendations were made for Taipei’s Subway Wayfinding System:

**Recommendation 1:** Consistency is important. Consistency throughout the system is the key to achieving an optical wayfinding design. One example is terminology consistency (See Figure 184). Consistency of sign location is also very important.

**Recommendation 2:** Simplification of information is important. Information arrangement and quantity must be considered in order to develop a clear sign layout (See Figure 168).

**Recommendation 3:** Location of a sign is important. Locate signs right at the decision point (See Figure 168).

**Recommendation 4:** Clarity is important. Design arrows, symbols, and pictograms with an emphasis on simplicity and clarity (See Figure 156).

**Recommendation 5:** In Taipei: the majority of daily or occasionally subway users are females. According to the study, “Women were more likely to report using a route strategy.” Landmarks are one of the route strategies in wayfinding. Make use of landmark design throughout the subway system, since they are an important factor assisting user’s navigation. Also because women desire more security, safety considerations are necessary.
The author now believes the major problem of the Taipei system is its consistency and legibility. If these recommended improvements are implemented, Taipei’s subway wayfinding system would serve users with more consideration and convenience. Beyond Taipei, however, wayfinding designers also can follow the criteria developed in this thesis, applying them anywhere in a constructed environment.

5.1 Implications for further study and broader application

Many problematic wayfinding issues actually exist in Taipei’s subway. All these problems could be resolved if wayfinding designers followed the theories and methods of existing research, and the recommendation outlined in this thesis. These theories and recommendations, while intended for Taipei, are useful for any wayfinding designer to improve navigation anywhere.

Observations made during this study suggest several areas for further research. Although universal design principles are intended for disabled people, they are also very useful to accommodate international users; additional research is needed in this area. Additionally, there remains a lack of research on specific wayfinding topics related to cultural perception. There are no regulations for Asian wayfinding systems that would support users with disabilities. This requires study and development to build standards or regulations for Asian wayfinding systems.
APPENDIX SURVEY INSTRUMENT

Appendix A includes the Iowa State University Human Subjects Review Approvals, both approved informed consent document in Chinese and in English, both survey questionnaires in Chinese and in English.
Human Subjects Review Approval

TO: Ying-Hsien Chen (Sonya Chen)
FROM: Human Subject Research Compliance Office

PROJECT TITLE: Graduate Thesis Documentation – Taipei’s Subway Wayfinding
RE: IRB ID No.: 05-284

APPROVAL DATE: July 6, 2005 REVIEW DATE: July 6, 2005
LENGTH OF APPROVAL: One year CONTINUING REVIEW DATE: July 5, 2006

TYPE OF APPLICATION: ☒ New Project ☐ Continuing Review

Your human subjects research project application, as indicated above, has been approved by the Iowa State University IRB #1 for recruitment of subjects not to exceed the number indicated on the application form. All research for this study must be conducted according to the proposal that was approved by the IRB. If written informed consent is required, the IRB-stamped and dated Informed Consent Document(s), approved by the IRB for this project only are attached. Please make copies from the attached “masters” for subjects to sign upon agreeing to participate. The original signed Informed Consent Document should be placed in your study files. A copy of the Informed Consent Document should be given to the subject.

The IRB must conduct continuing review of research at intervals appropriate to the degree of risk, but not less than once per year. Renewal is the PI’s responsibility, but as a reminder, you will receive notices at least 60 days and 30 days prior to the next review. Please note the continuing review date for your study.

Any modification of this research project must be submitted to the IRB for review and approval, prior to implementation. Modifications include but are not limited to: changing the protocol or study procedures, changing investigators or sponsors (funding sources), including additional key personnel, changing the Informed Consent Document, an increase in the total number of subjects anticipated, or adding new materials (e.g., letters, advertisements, questionnaires). Any future correspondence should include the IRB identification number provided and the study title.

HSRO/ORC 8/02
DATE: May 17, 2006

TO: Ying-Hsien Chen
CC: Professor Lisa Fontaine

FROM: Institutional Review Board
Office of Research Assurances

SUBJECT: IRB ID: 05-284

Approval Date: May 16, 2006  Date for Continuing Review: May 15, 2007

The Chair of the Institutional Review Board Chair of Iowa State University has conducted the annual continuing review of the protocol entitled: "Graduate Thesis Documentation-Taipei’s Subway Wayfinding." Your study has been approved for a period of one year. The continuing review date for this study is no later than May 15, 2007.

Just as a reminder, the federal regulations require continuing review of ongoing projects. Please submit the form with sufficient time for the IRB to review and approve continuation of the study, prior to the continuing review date. Failure to complete and submit the continuing review form will result in expiration of IRB approval on the continuing review date and the file will be administratively closed. A new application for IRB approval may be required to re-activate the study. In addition, all research related activities involving the participants must stop on the continuing review date, until approval can be re-established, except when necessary to eliminate immediate hazard to research participants. As a courtesy to you, we will send a reminder of the approaching review date approximately one month prior to this date.

Any changes in the protocol or consent form should not be implemented without prior IRB review and approval, using the "Continuing Review and/or Modification" form. These documents are located on the Office of Research Assurances website or available by calling (515) 294-4566, www.compliance.iastate.edu.

You must promptly report any of the following to the IRB: (1) all serious and/or unexpected adverse experiences involving risks to subjects or others; and (2) any other unanticipated problems involving risks to subjects or others.

Upon completion of the project, please submit a Project Closure Form to the Office of Research Assurances, 1138 Pearson Hall, to officially close the project.
資料根據的同意說明文件

研究的名稱: 研究生論文---臺北的地鐵尋找方向。
調查員: 陳盈先, 研究生。

這是一項研究。請花一些時間決定您想參與或者不想參與這項研究。您可以在任何時候問問題。

簡介
這項研究的目的是找出訪客在臺北的地鐵裡尋找方向時, 可能導致他們方向混亂的問題。

章程的說明
我希望詢問您幾個問題有關當您在地鐵系統裡, 您怎樣尋找您的方向。如果您同意參加這項研究, 此問卷調查持續約5 分鐘。

風險
參加這項研究沒有風險。

福利
對您並無直接福利。但希望在這項研究中所獲取的資訊, 將有益於未來臺北的地鐵用戶群。

費用和報酬
參加這項研究您不需任何費用。參加這項研究您不會有報酬。

參與者權利
您參與這項研究是出於完全義務的, 並且您在任何时候皆可以拒絕參與或離開。

機密
個人資訊不會包括在這個調查。由法律允許進一步確保機密, 以下是將採取的措施:
唯有本研究人員和指導教授, Professor Lisa Fontaine 將得到資料的存取與收集。

問題或疑慮
在這項研究期間的任何時候, 我們鼓勵您問問題。欲知關於研究的詳情請聯絡陳盈先, 515-292-8156, mood@iastate.edu。如果您有關於研究主題或與研究相關的傷害權利的任何問題, 請與Ginny Austin Eason, IRB 管理員, (515) 294-4566, austingr@iastate.edu, 或Diane Ament, 研究標準管理長聯繫, (515) 294-3115, dament@iastate.edu。
附屬的簽名

您的簽名表明您同意自願參加這項研究，並且您了解這項研究的內容。您將被給與足夠的時間閱讀文件，並且有關於您的問題皆會得到令你滿意的答覆。在您的參與期間，您將接受您簽字之資料根據的同意說明文件一份。

附屬的名字（正楷）________________________

（附屬的簽名）________________________________（日期）____________

我同意給我的孩子有權參與這項調查__________________(家長的簽名)

(日期) ____________

調查員聲明

我確認，參與者被給與充分時間閱讀和學習這項研究，並且他們的所有問題皆被答覆了。我的看法是，參與者瞭解這項研究的目的、風險、福利和規程，並且他們是自願同意參與這項研究。

________________________________________(調查員人員簽名)____________(日期)
INFORMED CONSENT DOCUMENT

Title of Study: Graduate Thesis - Taipei’s Subway Wayfinding
Investigators: Ying-Hsien Chen (Sonya Chen), Graduate Student.

This is a research study. Please take your time in deciding if you would like to participate. Please feel free to ask questions at any time.

INTRODUCTION

The purpose of this study is to find out what possible problems might cause navigational confusion to visitors finding their way in Taipei’s subway.

DESCRIPTION OF PROCEDURES

I would like to ask you a few questions about how you find your way in the subway system. If you agree to participate in this study, your participation will last for 5 minutes.

RISKS

There are no foreseeable risks at this time from participating in this study.

BENEFITS
There will be no direct benefit to you. It is hoped that the information gained in this study will benefit the future user groups of Taipei’s subway.

**COSTS AND COMPENSATION**
You will not have any costs from participating in this study. You will not be compensated for participating in this study.

**PARTICIPANT RIGHTS**
Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time.

**CONFIDENTIALITY**
No personal information will be required in this survey. To further ensure confidentiality to the extent permitted by law, the following measures will be taken: Only the investigator and the major professor, Lisa Fontaine will get access to the data collected.

**QUESTIONS OR PROBLEMS**
You are encouraged to ask questions at any time during this study. For further information about the study contact Ying-Hsien Chen (Sonya Chen), 515-292-8156, mood@iastate.edu. If you have any questions about the rights of research subjects or research-related injury, please contact Ginny Austin Eason, IRB Administrator, (515) 294-4566, austingr@iastate.edu, or Diane Ament, Research Compliance Officer (515) 294-3115, dament@iastate.edu.

***************************************************************************

**SUBJECT SIGNATURE**
Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. You will receive a copy of the signed and dated written informed consent prior to your participation in the study.

Subject’s Name (printed)  

(Subject’s Signature)  (Date)

I would give my permission to the child to participate this survey.  

(Parent’s Signature)  

_________________________ (Parent’s Signature)  

_________________________ (Date)
INVESTIGATOR STATEMENT

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

______________________________                   ______________________________
(Signature of Person Obtaining Informed Consent)       (Date)

您的台北地鐵經驗問卷調查

日期:

_____ 我自願同意參加地鐵經驗問卷調查

_____ 我同意讓我孩子參加地鐵經驗問卷調查 (適用小於18歲)

1. 您使用台北的地鐵經驗有多頻繁?
   a) 每日 b) 偶爾 c) 一兩次 d) 第一次

2. 當您使用地鐵時，您覺得找到方向很麻煩嗎? _____ 經常 _____ 有時 _____ 從未

3. 尋找您的方向時，什麼使您最困擾?
   _____ 缺乏指標 _____ 不知道在哪裡尋找資訊 _____ 不清楚我在哪裡
_____太多選擇_____指標資訊不是很清楚_____指標不易讀
_____其他：

4. 定向(方向)指標大到足夠使您注意嗎？是 不是

5. 關於指標A的安置地點您的看法是什麼
   (關於指標A的類型被列於這裡)
   _____太高_____太低_____恰好高度
   _____離決定點太遠
   _____地點很清楚：
   _____好地點

5-1. 指標A對您有用嗎？
   _____沒有用的_____有些有用的_____非常有用

6. 關於指標B的安置地點您的看法是什麼
   (關於指標B的類型被列於這裡)
   _____太高_____太低_____恰好高度
   _____離決定點太遠
   _____地點很清楚：
   _____好地點

6-1. 指標B對您有用嗎？
   _____沒有用的_____有些有用的_____非常有用

7. 關於指標C的安置地點您的看法是什麼
   (關於指標C的類型被列於這裡)
   _____太高_____太低_____恰好高度
   _____離決定點太遠
   _____地點很清楚：
   _____好地點

7-1. 指標C對您有用嗎？
132

_____ 沒有用的 _____ 有些有用的 _____ 非常有用

8. 關於標誌D的安置地點您的看法是什麼

(關於標誌D的類型被列於這裡)

_____ 太高 _____ 太低 _____ 恰好高度

_____ 離決定點太遠

_____ 地點很不清楚： ____________________________

_____ 好地點

8-1. 標誌D對您有用嗎？

_____ 沒有用的 _____ 有些有用的 _____ 非常有用

9. 以下是指標的字體類型和易讀之相關問題:

a) 英文字體類型夠大嗎? 是 不是

b) 符號或圖標能幫助您認出你的位置嗎? 是 不是

c) 標誌的中文字體類型容易讀嗎? 是 不是

d) 其他評語(建議): ____________________________

10. 地鐵內部的購物店的燈光招牌或廣告會分散您對標誌的注意嗎?

您能給實例嗎？ ____________________________

11. 請看此箭頭於 ____________________________，您認為箭頭的指示方向為?

(列如: 紐約的大中央)

______________________________

12. 標誌的文字表達法您覺得清楚嗎? 如果不清楚, 為什麼?

______________________________

13. 各個入口清楚地被標記了嗎? a) 是 b) 不是 c) 記不得

14. 您是否還記得使您困擾的任何其它地鐵站嗎? 如果那樣, 是在哪裡的地鐵站?
Your Subway Experiences in Taipei

Date: dsf

I agree to participate in this survey voluntarily.

If minor, parent agree to allow child to participate

1. How often do you use Taipei’s subway?
   a) Daily  b) Occasionally  c) Couple of times  d) First time

2. How often do you find it confusing to find your way to your destination when using the subway?
   ____ often
   ____ sometimes
   ____ never

3. What makes you most confused about finding your way?
   ____ lack of signs
   ____ not knowing where to look for information
   ____ confused about where I am
   ____ too many choices
   ____ sign information isn’t clear
   ____ sign is hard to read
4. Are the directional signs big enough for you to notice?  Y  N

5. What is your opinion of the placement of sign A
   (sign type to be listed here)
   __ too high
   __ too low
   __ good height
   __ too far from decision point
   __ confusing location: ________________________________
   __ good location

5-1. Is sign A helpful to you?
   __ not helpful
   __ somewhat helpful
   __ very helpful

6. What is your opinion of the placement of sign B
   (sign type to be listed here)
   __ too high
   __ too low
   __ good height
   __ too far from decision point
   __ confusing location: ________________________________
   __ good location

6-1. Is sign B helpful to you?
   __ not helpful
   __ somewhat helpful
   __ very helpful

7. What is your opinion of the placement of sign C
   (sign type to be listed here)
   __ too high
   __ too low
   __ good height
   __ too far from decision point
   __ confusing location: ________________________________
   __ good location

7-1. Is sign C helpful to you?
   __ not helpful
   __ somewhat helpful
   __ very helpful

8. What is your opinion of the placement of sign D
   (sign type to be listed here)
   __ too high
   __ too low
   __ good height
   __ too far from decision point
   __ confusing location: ________________________________
   __ good location
8-1. Is sign D helpful to you?
   _____ not helpful
   _____ somewhat helpful
   _____ very helpful

9. These questions deal with the type and legibility of the sign:
   a) Is the English type size big enough for you to read?  Y  N
   b) Is the icon or symbol helping you recognize (find) your location?  Y  N
   c) Is it easy to read the words on this sign?  Y  N
   d) Other comments: ____________________________________________

10. Is there any location where interior shops or advertisements would distract your notice about wayfinding signs? Could you give examples?  ____________________________________________

11. Looking at the arrow for __________________________, which way do you think it means?
    (List destination: ex. New York’s Grand Central)

12. Is any of the wording on this sign confusing? If so, what?
    ____________________________________________

13. Was each entrance clearly marked?
    a)  Yes  b) No  c) Can’t remember

14. Do you remember any other subway stations that have problems? If so, where?
BIBLIOGRAPHY

"AIGA Name" [AIGA | the professional association for design], 2006 [cited 20 March 2006]; available from http://www.aiga.org/content.cfm/aiganame


"Symbol Signs" [AIGA | the professional association for design], 2006 [cited 20 March 2006]; available from http://www.aiga.org/content.cfm?ContentID=147


NOTES

3 Ibid., 46.
4 Erwin Panofsky is German art historian. His birthplace was in Hanover, and he moved to New York in 1935. Erwin Panofsky finally developed an iconographic approach to art and interpreted works through an analysis of symbolism, history and social factors.
13 Wendy Leeds-Hurwitz, Semiotics and Communication-Signs, Codes, Cultures (London: Hillsdale, New Jersey, 1993), XV.
17 Per Mollerup, Marks of Excellence-the History and Taxonomy of Trademarks (New York: Plaidon Press Inc., 2004), 84.
19 Edmund Leach, Culture and Communication-the Logic by Which Symbols are Connected: An Introduction to the Use of Structuralist Analysis in Social Anthropology (London: Cambridge University Press, 1976), 34.
21 Ibid., 25.
29 Arvid E. Osterberg and Donna J. Kain. Access for Everyone-A guide to Accessibility of Buildings and Sites with References to ADAAG (Iowa State University, 2005), 5.

Ibid., 13.

Ibid., 12.


Ibid., 74.


Miller and Lewis, “Wayfinding-Effective Wayfinding”, 76.


“The Americans with”, 18.


Ibid., 19.

Ibid., 23.

Ibid., 27.

Ibid., 31.

Ibid., 35.

Ibid., 39.

Ibid., 43.

Ibid., 47.

Ibid., 51.

Ibid., 52.

Ibid., 55.

Ibid., 59.


Ibid., 12.


Ibid., 70.
Miller and Lewis, “Wayfinding-Effective Wayfinding”, 98.
Ibid., 22-23.
Ibid., 187.
Craig M. Berger., “Wayfinding Design and”, 77.
Ibid., 73.
“Signage Guidelines: ADA.”
Ibid., 88.
Ibid., 94.
Ibid., 2:10.
Ibid., 30-34.
Ibid., 2:16.
“Signage Guidelines: ADA.”
Ibid., 2:10.
Ibid., 93.
Ibid., 129.
Ibid., 117.
Craig M. Berger, personal email letter to author, 28 February 2006.