Knowledge-based Engineering and Sciences (2022), **3**, (2), 52–65
doi:10.51526/kbes.2022.3.2.52-65

RESEARCH PAPER

Proposition on the Redesigning Outdoor Guidance Systems on Campus: A Case Study of Southwest Minzu University Aeroport Campus in Southwest China

Yirui Hei,[*,1] S. Siti Suhaily,[1] Jinming Wu,[2] Chenlei Yuan,[2] and Haojiang Guo[2]

[1]School of The Arts, Universiti Sains Malaysia, 11800 Penang, Malaysia
[2]Department of Architecture, South West Minzu University, China
[*]Corresponding author. Email: heiyirui@163.com

(Received 01 August 2022; revised 25 August 2022; accepted 29 August 2022; first published online 31 August 2022)

Abstract

This research was established to assess the campus guidance system design of Southwest Minzu University. Using the classification method of guidance systems, this campus outdoor was divided into three levels of systems: general guidance signs, area guidance signs, and induced guidance signs. Then after. it was divided into pedestrian guidance systems and vehicle guidance systems from different users and uses the methods of fixed-point photography and field research for data collection and analysis. Through realistic logical classification and scientific research, a standardized and systematic logic of the campus outdoor guidance system was formed. Finally, the form, color, and pattern of the system were designed according to the characteristics of Southwest University for Nationalities (SMU). The combination of rigorous logic and characteristics is a design approach that can be used as a model for other university campuses.

Keywords: Campus; signage; redesign; Southwest China

1. Introduction

Southwest University for Nationalities (SMU) is a comprehensive university for nationalities directly under the Chinese Ethnic Affairs Commission, founded in July 1950 and officially established on June 1, 1951. The university has 12 disciplines and covers an area of nearly 3,000 acres, and is divided into three campuses, SUM offers a variety of facilities such as teaching spaces, offices, accommodation, lounge areas, sports grounds, libraries, etc. The SUM campuses are therefore highly similar to the types and services offered by the city, with the SUM campuses generating a large amount of pedestrian and vehicular traffic, with students forming the largest user group, followed by parents, staff, neighborhood residents, academic exchange specialists, etc., all of whom have distinct travel characteristics. The Aeroport Campus is the campus with the largest number of students, the widest range of disciplines, the largest number of new students moving in and the high mobility of foreign people, so the guidance system is very important in it.

However, on most university campuses today, the design of signage is characterized by a lack of clarity of information, confusion over where to place information, over-complication of information, or the formation of a vacuum [8]. This is the case with the SUM, which has a large footprint and many functional buildings, making it very difficult for high-frequency students and teachers to find their way around unfamiliar functional areas, as well as for low-frequency residents, experts

in academic exchange and suppliers to find their destinations. In this context, it was necessary to standardize the design of the SMU Aerodrome campus and this design has a common design philosophy and approach to other campus designs.

The pedestrian guidance system (PGS) is divided into three levels (General, Area, and Indication) and is based on the analysis of pedestrian flow and area classification using spot photography and field surveys. The CNS is divided into two levels (guide and inducement), the analysis of traffic flow and car park planning is carried out through the field survey method, then each location requiring a guide sign is marked on the plan, and finally, the design is standardized according to the requirements of the Chinese road traffic signage installation code. SUM is a university in Chengdu, Sichuan Province, China, so all our signage designs are mainly in Chinese, with English as a secondary language, but for the convenience of more international scholars, we will label our signage designs in English.

The guidance system mainly consists of general plans, zones, inducements, and specific instructions. Depending on the properties of the space, the various means of communicating spatial information - graphics, maps, typefaces, colors - are specifically planned and combined to form a system of information appropriate to the specific space [7]. Among the basic elements of a guidance system, the idea of putting people first is an important trendsetter in all areas of design, and guidance systems are no exception. The great German designer Otl Aicher said: "Finding your way is not a gift, nor is it an innate ability. It is a prerequisite for life itself. Our attitude to any environment is part of our existence. Living according to our ways of navigation is a basic prerequisite for our freedom and self-confidence. Knowing where I am, where I am, is a prerequisite for knowing where I have to go, wherever it may be". The focus of a guidance system is not on innovation and beautification of appearance nor cultural empowerment and transmission, these are upper levels of design based on a human-centered, wayfinding strategy, the basic function that a guidance system needs in the first place is a wayfinding strategy. The designer has to develop the object relationship as the idea of a wayfinding strategy. The wayfinding process involves aspects such as knowing one's location, knowing the location of the destination, knowing the route to the destination, knowing the route to the destination, on and knowing the route back to the origin [10]. Wayfinding signs are a medium for communicating information about 'direction, location, and safety, helping people to form behavioral patterns to get from one place to another and to know the circuit. They are designed concerning human-computer interaction in both vehicular and pedestrian systems. The height of the human eye in different positions is an important element of ergonomics. In signage systems, ergonomics has a special task of ensuring that three important things are done well: information, direction, and destination [12]. Human-computer interaction in pedestrian systems requires attention to the fact that in a pedestrian system people walk in space and after a certain distance usually looks for confirmation of direction and location, so the recommended interval between walking signs is 150-300 meters. The number of signs in a walker system is dense and frequent because people need to maintain a sense of continuity in information acquisition while moving, otherwise they tend to get lost in the short distance range of the signage vacuum [20].

What will be the needs of PGS on university campuses? The first and most basic need for PGS on university campuses is to help people find their way to their destination. Every day, thousands of students or visitors waste valuable time wandering around university campuses trying to find a specific building, a specific classroom, or a shop because there is no proper signage system [2]. And it is not only students and professors who now enter the campus, but also many people from outside, the most representative of the neighborhood and tourists. Universities are gradually becoming a cultural attraction of a city, and the attraction of universities has objectively accelerated the construction of campuses and the upgrading of facilities, which requires the design of campus guidance systems in universities to take on more functions and build a functional composite guidance system that integrates guidance, art, and culture, to better guide visitors, maintain order and display the image [16]. Secondly, PGS on university campuses can play an important role in promoting the construction

of university culture [15]. To achieve an important role in the construction of university culture, then PGS on campus cannot be just basic design. Text, typography, and color are important elements that help people to quickly identify important information and read specific content in detail Finally styling is a way of further sublimating the design of the guide through the designer's understanding and aesthetic sense after the base has met people's practical needs. Styling includes the integration or accentuation of the surroundings, the display of cultural heritage, the choice of materials, conveying emotions, and sustainability. Designers need to refer to the design strategies of emotional durability in visual communication design, namely enjoyment, functionality, narrative, symbolism, interactivity, and innovation [6].

We should not only focus on the pedestrian system on campus but also on the vehicular system on campus. From a macro perspective, the aspects of human-computer interaction in the vehicular system need attention: in the vehicular system, the amount of information in the signage is very limited because the driver receives the information from the signage while moving at high speed. The installation method, height, and information presentation of the signage are very different from the pedestrian signage system. Because of the congestion at junctions and the need for drivers to juggle signals, junctions are a vacuum for guidance information [1]. Our first concern in CNS is the same as in PGS, that is, users need to find their destination quickly. At particular times of the day, there are also low-frequency groups: academic exchange specialists, new students, and parents. Among the low-frequency users, finding a destination is their first need. In the high-frequency group, parking is their highest need. Each category of high-frequency users has its own unique spatial and temporal usage patterns. Campus parking infrastructure typically consists of several (open) car parks and (multi multi-stored) garages, each with a few to several thousand parking spaces [9]. Finally, congestion is always present on campus during commuting and drop-off times, and the problem of campus parking congestion often leads to several negative consequences in terms of campus traffic. The consequences include staff and faculty being late to class or work; an increase in the number of parking violations; and the spillover of parking spaces into neighboring communities, causing complaints from businesses, property owners, and residents [4].

The current university's wayfinding design is confusing and repetitive in terms of point settings, and the overall wayfinding system on campus lacks a systematic and holistic approach, which seriously undermines the wayfinding role of signage. At the same time, the lack of culture, uniqueness, and artistry leads to the campus guidance system failing to achieve the purpose of creating a cultural atmosphere on campus [14]. Many Chinese and foreign universities suffer from the same problem [3, 19, 18, 13]. With the ultimate design goals of a clear hierarchy, clear identification, unified style, clear messaging, pedestrian safety, rationalization of the guidance system and orderliness of the system, and the development of a design strategy with both identification and aesthetic functions, new ideas are offered for the design of pedestrian and CNS on campus, and a new process of SUM guidance system construction is taken.

2. Methodological Overview

The fixed point method: so-called fixed point photography is actually standing in the same location and shooting the action for the same selected issue. NLean 5S Management is to be used for the analysis of pedestrian systems [11]. Through fieldwork different time periods are selected for filming and recording, fixed variables for fixed points and timings, with pedestrian flow as a variable, using two principles as a reference i. Careful consideration of the position of the guide signs placed so as not to add to the congestion of the crowd, ii. allowing the crowd to quickly find their way through the guide signs by quickly navigating through them to clear the crowd. The final analysis and statistics will reveal the locations of crowded areas and signage on campus.

Fieldwork method: The fieldwork method requires the investigator to live with the subject for a period of time, from which they can observe, understand and know their society and culture [21].

It is mainly used for the analysis of carriageway systems. By measuring and mapping the existing carriageway system to analyze whether it is safe and logical to drive, and finally by summarizing the analysis to plan an ergonomic carriageway system.

Figure 1: *SMU campus guidance system redesign flowchart.*

3. Data Analysis

We have followed a design plan that includes information about the campus environment, the spatial organization of the campus buildings, the target areas of the campus and the sequence of messages to be conveyed. In both PGS and CNS planning, three basic questions about the guidance system

are clarified through research: Who are the users? Where will it be installed? In what way is the information presented?

Who are the users? We first divided the school according to the people entering and leaving the school: some of the green areas, intermediate roads, and activity areas are more populated by outsiders, and the living and teaching areas are more regular, including students, parents, staff, and takeaways. The new student population is special and may require additional guide signs or replacement at some point. Workers, nearby residents, and families of staff should also be considered. Finally, we divide all incoming crowds into high-frequency users (staff, takeaway boys, students, stockists) and low-frequency users (neighborhood residents, academic exchange specialists, new students and parents, friends of students, students from neighboring universities, filming staff).

Where are the installation locations? In the installation locations, we have to analyze three aspects of PGS, CNS, and mixed systems for people and vehicles. Firstly, we used the spotting method to obtain information on crowd flow. This time, we took ten spotting maps of the locations taken by eight people: Yirui Hei, Haojiang Guo, Chenlei Yuan, Zheng Zhao, Jinming Wu, Jiachao Long, Lifang Yu, Jiaying He, and Zhenjiang Liu, and the data was counted and summarised by Yirui Hei and Jinming Wu. We chose to take multiple shots at fixed locations at multiple times of the day during school hours and then overlapped the images to form the crowd pressure point map.

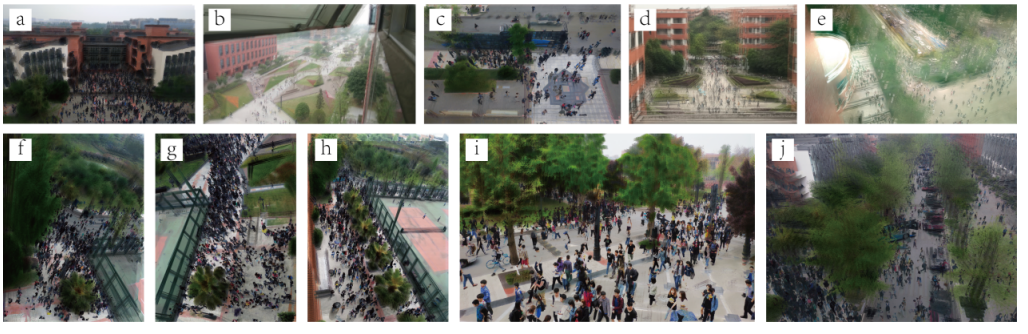

Figure 2: *SUM Aeroport Campus pedestrian flow pressure map taking points: (a) South Academic Building, (b) Central Plaza, (c) School bus drop-off area, (d) North Academic Building, (e) South Gate entrance into the school, (f) South Athletic Area, (g) South Athletic Area and Central Plaza intersection, (h) South Athletic Area and South Academic Area intersection, (i) North Living Area, and (j) South Cafeteria area.*

Problems identified through the spotting method: i. Congestion during class hours is mainly in the canteen and dormitory areas, due to the long waiting time for students in both areas, causing the road section to be unobstructed. ii. Congestion during class hours is mainly in the school building area and the dormitory area, due to many bifurcated intersections, poor crowd diversion, and high congestion on the shortcut road section. iii. Special congestion is mainly during the departure time of the school bus, where the queues are were too long, causing inconvenience to other vehicles and pedestrians.

We then carried out a site visit to the carriageways, footpaths, and their guidance systems on campus, which was filmed by Yirui Hei, Haojiang Guo, Chenlei Yuan, and Jinming Wu. 21 pedestrian junctions were filmed, and 20 key traffic paths were filmed. The data was compiled and summarised by Yirui Hei and Chenlei Yuan. All existing outdoor pedestrians and CNSs were photographed and analyzed to summarise their problems and to lay the foundation for improving and redesigning the new guidance system.

The site visit led to the following conclusions about the pedestrian guidance system: i. Only 6 of the 21 existing guidance systems can be placed in situ, 11 of the others need to be integrated with the environment (street lights, cameras, lawns) and 4 areas have created a guidance vacuum that needs to

Figure 3: *SUM Aerodrome Campus multiple field shots.*

Figure 4: *(a) Central Plaza at the junction with hostel block 22.16, guidance guide signs combined with cameras, (b) Hostel block 13 entrance, guidance signage combined with street lights, (c) Lhasa Road at the junction with Northwest Gate, general regulation guide signs and guidance guide signs repositioned, (d) Southeast Gate, general regulation guide signs repositioned, (e) South Heaven Gate guidance guide signs repositioned, (f) Hohhot Road at the junction with Qingxing Avenue, in-situ tactile guide signs, (g) Junction of Yinchuan Road and Qingxing Avenue, in-situ tactile and area guide signs, (h) Junction of Lanzhou Road and Qingxing Avenue, tactile guide signs integrated with street lights, (i) South Gate, in-situ general regulation guide signs, (j) Junction of Lanzhou Road and Hongxing Avenue, tactile guide signs integrated with street lights, (k) Junction of Yinchuan Road and Hongxing Avenue (l) junction of Urumqi Road and Hongxing Avenue, guide and area guide signs integrated with street lights, (m) junction of Xining Road and Hongxing Avenue, guide and area guide signs placed in situ, (n) Nova Theatre, area guide signs placed in situ, (o) junction of Rongcheng Road and Jinxing Avenue, guide and area guide signs integrated with street lights, (p) junction of Lasa Road and Jinxing Avenue, integrated with lawn, (q) Guiyang Road and Gingko Avenue, integrated with street lights, (r) Art College, integrated with lawn, (s) Rongcheng Road and Gingko Avenue, integrated with street lights, (t) Kunming Road and Gingko Avenue, repositioned guide and area signage, and (u) Yuzhou Road Junction with Ginkgo Avenue, in-situ directional signage.*

be reinstated. ii. The existing guidance system is confusingly graded and needs to be re-planned for general, regional, and tactile signage. In the new plan, there are 3 master plan signs, 5 area signs, and 18 tactile signs, some of which need to be used in conjunction with tactile signs.

We have concluded from the site visit that the traffic guidance system: i. According to the problem of difficult parking for teachers and the lack of parking spaces, some areas need to increase the number of parking spots. ii. Some roads are shared by people and vehicles, but from the point of view of the fixed shot method, the flow of people on these roads is too large, the probability of danger on these roads is too high and will increase the chances of congestion, so we have increased the number of no-passing sections. iii. Due to the lack of clear directions and roadblocks, vehicles

Figure 5: *(a), (b) additional parking spaces, (c), (d) additional parking spaces, and (e) separation of pedestrian and vehicular traffic.*

often travel in the opposite direction.

The next step was to modify the map on the old masterplan signage to take into account the layout of the campus. The data was taken from the map on the old masterplan signage and the plan of the SUM Aerodrome in Baidu Maps.

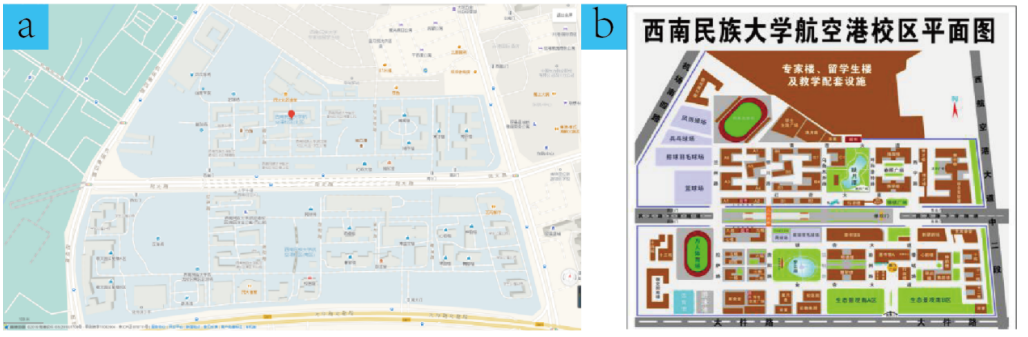

Figure 6: *(a) From: https://map.baidu.com/@11826597.44,4622376.14,12z, and (b) From: https://www.nipic.com/show/18032693.html.*

The plan of the SUM Aeroport Campus has been modified by combining the spot-photography method with the fieldwork method, and the legend has been changed to English for ease of reading. We have divided the school into two main zones and seven smaller zones, the southern zone, and the northern zone, bounded by the central square to the south and the northern zone to the north. The seven smaller areas are shown in different colors: the administrative area (red), the green area (green), the north teaching area (orange), the north living area (blue), the north sports area (purple), the south teaching area (yellow), the south living area (light blue) and the south sports area (light purple). Compared to the original campus plan, the redesigned campus plan is coned and logical, allowing users to find their destination in the shortest possible time.

4. Pedestrian Guidance System Design

The PGS design is based on the principle of harmonization and contrast where the body of the signage blends in with the environment [5]. However, it can be found quickly when people need it because in schools there is little demand for guidance from high-frequency users and only a large demand for guidance systems from low-frequency users and at special times (e.g., at the start of the school year).

Firstly, we divided the area guide signs into an equal circle. We divided the entire campus into 7 zones, and in each of these zones, we had to have zone signage.

The seven zones are then used to create different signage, depending on the density of the crowds and the reality of the road. Next, we started to work on the colors, lettering, and character of the signage. In the overall design, grey and navy blue were used as the main colors, with yellow and red

Figure 7: *Redesign of the campus map.*

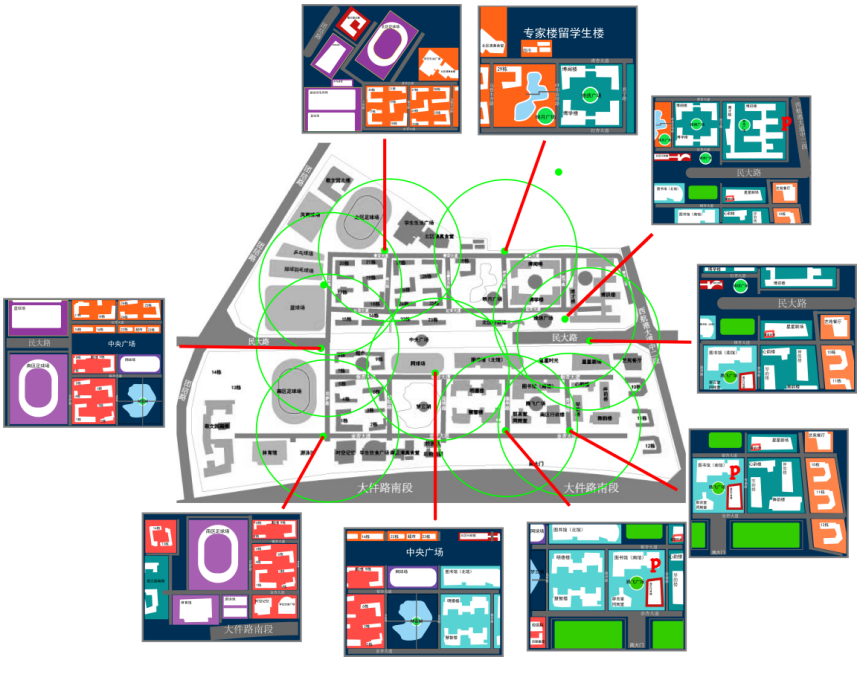

Figure 8: *Division of campus area guides.*

as secondary colors. These four colors are representative of the school: grey for inclusiveness: navy blue for our heritage: yellow for the school's characteristic tree, ginkgo tree: and red for China. In the graphic and three-dimensional presentation, we have used the university's initials, the emblem, and the iconic buildings of the campus to highlight its character as a guide sign for the SUM Aeroport Campus, and in the pattern, we have chosen an abstract form of traditional Chinese ethnic motifs to indicate our character as an inclusive Chinese minority campus. In the font specification, the Chinese font is bold; the English font is Microsoft YaHei UI; the font size of the general guide sign is 110pt (school name), 48pt (commentary), 70pt (first level characters), 34pt (second level characters), 22pt (third level characters); the font size of the regional guide sign is 48pt (commentary), 70pt (first level characters), 34pt (secondary characters), 22pt (tertiary characters); font-size of guide signs: 170pt (6cm).

Redesign of the General Regulations guide sign: In the design of the General Regulations guide sign we have followed the principle of highlighting the information, the main panel has an ergonomic inclination, the dimensions 1200mm × 1450mm × 790mm, this size is by the rules of the General Regulations guide sign and the width of the bottom surface makes it strong enough. The design incorporates the school's name abbreviation to highlight the signage and in the main panel, we have used a hollowed-out design, with the hollowed-out area being the surrounding buildings of the school.

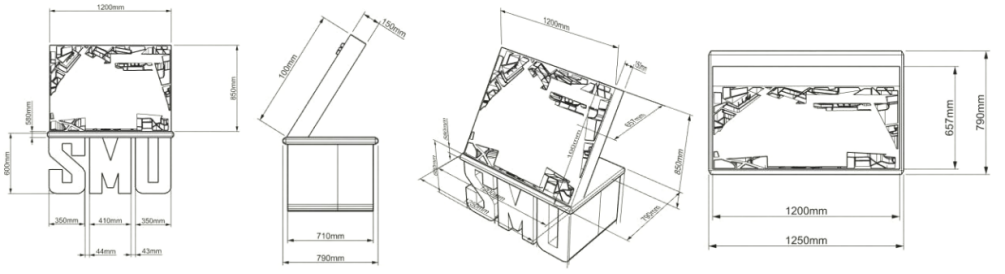

Figure 9: *Dimensional drawing of the redesigned campus masterplan guide sign.*

Figure 10: *Rendering of the redesigned campus masterplan guide sign.*

The design of the regional signage follows the ergonomic and design principles [17], with the school's symbolic building "South Gate" above it, the school logo and the name of the school visible in the lighting downwards, followed by the colorful stripes in the form of abstraction of traditional Chinese national motifs, and then the regional map and legend.

Redesign of the guide signs: In the design of the guide signs we have used a lightweight design and combined some of the guide signs with street lights and cameras to add new practicality without destroying the original function. The upper part of the signage still uses the "South Gate", the

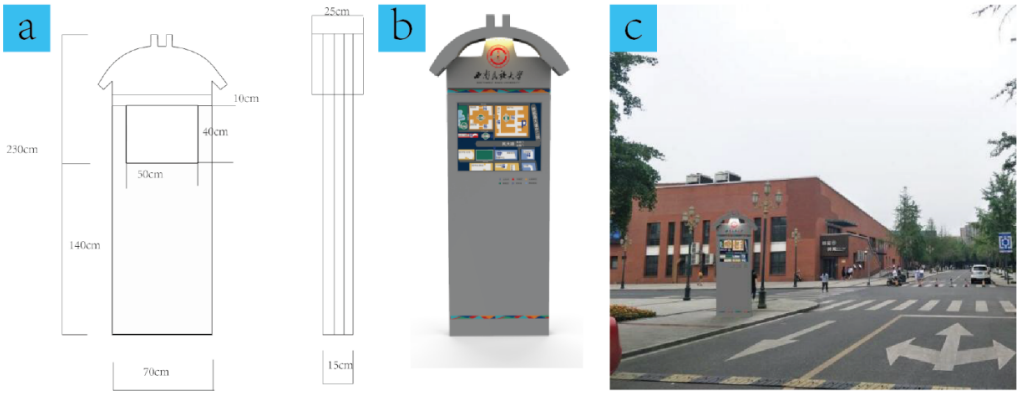

Figure 11: *(a) Dimensional drawing of the redesigned campus area guide sign, (b) Rendering of the redesigned campus area guide sign, and (c) Effect of the redesigned campus area guide sign.*

school's symbolic building, while the lower part of the signage can be installed at a free angle. The colors used are grey, with yellow and red as secondary colors.

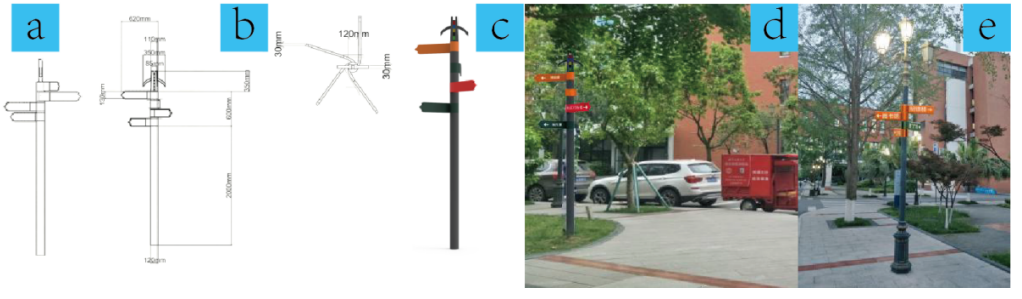

Figure 12: *(a) Dimensional drawings of redesigned campus-induced guide signs, (b) Dimensional drawings of redesigned campus-induced guide signs combined with columns such as street lights or cameras, (c) Rendering of redesigned campus-induced guide signs, (d) Effect of redesigned campus-induced guide signs, and (e) Effect of redesigned campus induced guide signs combined with columns such as street lights or cameras.*

Composite signage redesign: Because of the demand for composite signage with area guides and tactile guides found in the previous research, we have added the design of composite signage with area guides and tactile guides to the area guide signs. The form of the composite signage is the same as that of the regional signage, except that the guide area is placed between the colored strip and the regional map so that the height is ergonomic and can be easily seen from a distance when people need to read the guide. When people need to read the area guide carefully, they can stand in front of it without having to look up.

In the overall PGS redesign, we have maintained a continuity of access to information and eliminated the vacuum in the original design. The overall design has been designed with ergonomics in mind, making it easier for those who need to access information to read the content more easily. The appearance of the guidance system uses an integrated design approach, highlighting the school's characteristics while blending well within the environment.

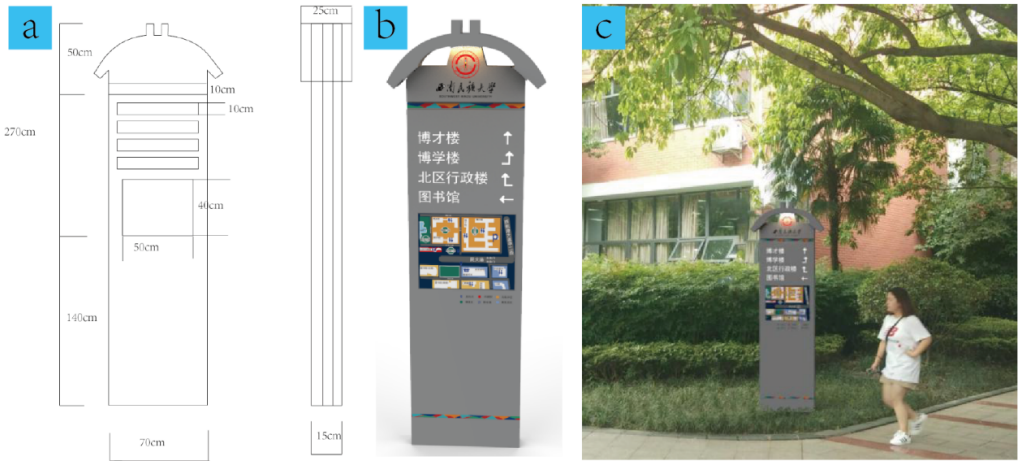

Figure 13: *(a) Dimensional drawing of the redesigned campus composite guide sign, (b) Rendering of the redesigned campus composite guide sign, and (c) Rendering of the redesigned campus composite guide sign.*

5. Vehicular Guidance System Design

Xiang Fan in the 2009 publication "Design of Guided Signage Systems" similarly mentioned the principles of CNS design: because drivers are moving at high speed to receive information from the signs, the amount of information on the signs is very restricted, and the installation method, height and information presentation of the signs are very different from pedestrian signage systems. Because the junction is crowded with people and vehicles and drivers must juggle signals more than anything else, the junction is a vacuum of guidance information. Hence, we planned the information for the pedestrian guide signs first.

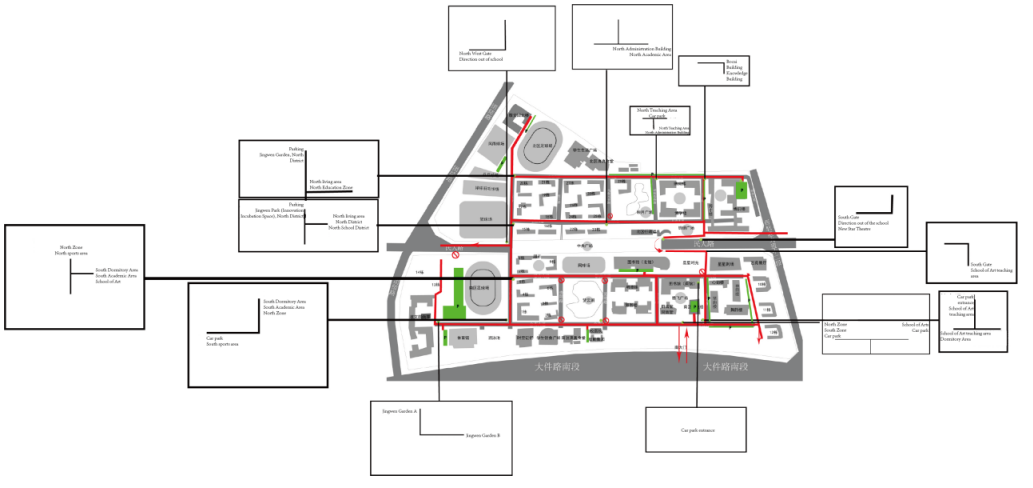

Figure 14: *Planning of the placement points and content of each vehicular guide.*

Because there are still differences between CNS on campus and CNS in the city, the school campus motor vehicle safety management system stipulates that staff and school motor vehicles leaving and arriving on campus should avoid the peak hours for students, have a speed limit of 5 km/h, and are strictly prohibited from sounding horns and turning on headlights (School campus

motor vehicle safety management system.2014). As the speed of motor vehicles on campus is not high, the guidance signs in the PGS can be seen within a certain range, so we have combined the vehicle guidance information map and the pedestrian information map to form the final vehicle guidance information map.

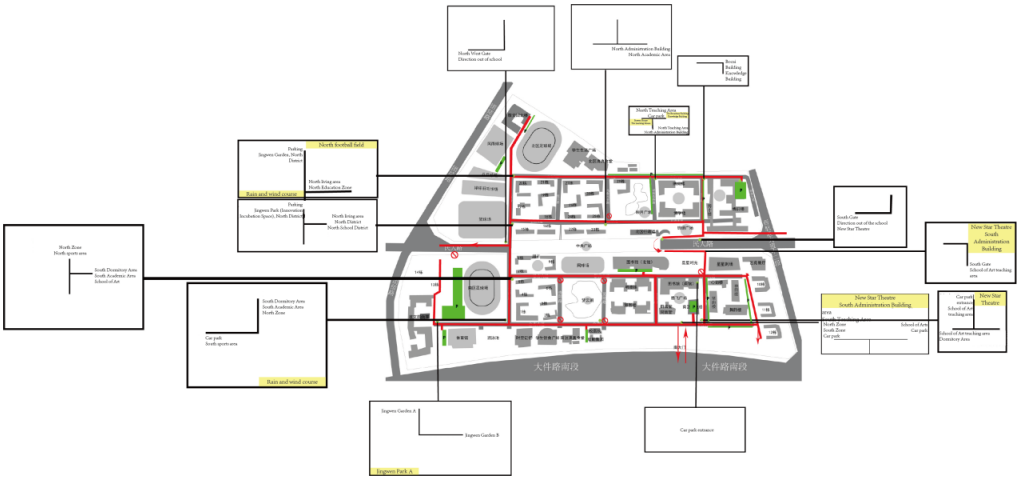

Figure 15: *Planning the placement and content of the integrated design of pedestrian and vehicle guidance.*

Next, we started to do the specification size of the guide signs, the traffic guide signs are different from the road guide signs, the traffic guide signs have a unified specification because SUM is a Chinese university, so we follow the Chinese road traffic signage installation specification requirements for design planning.

Figure 16: *(a) How to install a car navigation sign, (b) Design specifications for vehicular guide signs, (c) Effect of secondary vehicular guide signs combined with street lighting, (d) Effect of primary guide signs, and (e) Effect of secondary guide signs.*

A campus is a place where motorists, non-motorists, and pedestrians travel in tandem, so the campus signage system needs to be planned and designed in an integrated manner. The pedestrian-vehicle complex is a signage system that takes into account the fact that both pedestrians and motorists can use it (Signage Library.2022). We provide dual information in the same road space, and the campus,s we need to integrate the information planning for the classification of the vehicle signage, the amount of information released, the size of the individual information content and font contrast, etc., to form a complete information system for each, which we have used in the SMU campus signage design.

6. Modelling Results

We developed an SMU-specific outdoor signage system by establishing SMU's standard signage logic and creating a unique SMU identity for the signage system. In establishing the signage logic, we re-planned the hierarchy, number, and location of pedestrian signage systems and improved the information design to address the problems of unclear indicators, confusing information placement, and overly complex or vacuumed information in the campus signage design. For the vehicle guidance system, we have re-planned the road driving direction, pedestrian and vehicle diversion, barricades, and parking by the requirements of China Road Safety Management Network [22], which to a certain extent solves the problems of road congestion, pedestrian safety, insufficient parking spaces and parking spaces too far from the destination.

For the signage system features, grey and navy blue have been used as the primary colors, with yellow and red as secondary colors. The logo and campus landmarks are used to emphasize the identity of the signage as the SMU Aerodrome campus, while the motifs are abstract forms of traditional Chinese ethnic motifs used to illustrate our identity as an inclusive Chinese minority campus. In summary, this is a logical and distinctive approach to campus identity design. The steps are: first, identify campus problems through spot photography and field research, then analyze the problems and propose solutions, then construct a logical and complete identity system that fits the actual campus situation, and finally create a distinctive design based on the logic.

7. Conclusion

The research was initially adopted to redesign outdoor guidance systems on campus for Southwest Minzu University Aeroport campus in southwest China. The motivation of the current research was based on the necessity to come up with more reliable outdoor guidance system for the university campus. The proposed modeling framework was confirmed the possibility of the redesign system with better and reliable management sustainability.

Acknowledgment

The authors would like to thank Zheng Zhao, Jiachao Long, Lifang Yu, Jiaying He, and Zhenjiang Liu for their help in filming the data collection. In addition, the authors very much appreciating Jinming Wu, Chenlei Yuan, and Haojiang Guo for working together to complete these analytical studies and designs. Special thanks to the anonymous experts for their comments and design suggestions to refine the overall process of this study. Finally, a great thanks to Dr S. Siti Suhaily, who gave instruction to form this research.

Conflicts of Interest: **The authors have no conflict of interest to any part.**

References

[1] N. L. Carutasu et al. "Signage and ergonomics in packaging systems". In: *DAAAM Proc* (2017), pp. 177–179.

[2] I. Cirja. "The creation of a signage system tailor-made for UPB's Campus". In: *J Ind Des Eng Graph* 16 (2021), pp. 43–46.

[3] A. Danarto, Y. A. Djalari, and S. Sumartono. "Perancangan sistem signage kampus dengan studi Kasus Universitas Tarumanagara". In: *VISUAL* 1 (2014), pp. 1–14.

[4] O. Gurbuz and R. L. Cheu. "Survey to explore behavior, intelligent transportation systems needs, and level of service expectations for student parking at a university campus". In: *Transp Res Rec J Transp Res Board* 2674 (2020), pp. 168–177.

[5] R. Jacob et al. "The design analysis of campus guide sign system based on the comparison of Sino-Korea Colleges". In: *Int. Symp. Web Wirel. Geogr. Inf. Syst. Springer*. 2009, pp. 187–198.

[6] S. Ji and P. S. Lin. "Aesthetics of Sustainability: Research on the Design Strategies for Emotionally Durable Visual Communication Design". In: *Sustainability* 14 (2022), p. 4649.

[7] I. E. Kanat and S. Ozkan. "Explaining citizen adoption of government to citizen services: A model based on Theory of Planned Behaviour (TBP)". In: *Proc. Eur. Mediterr. Conf. Inf. Syst*. 2009.

[8] S. Kim et al. "Designing digital signage for better wayfinding performance: New visitors' navigating campus of university". In: *24th Int. Conf. Interact. Sci. IEEE*. 2011, pp. 35–40.

[9] T. Litman. *Parking Management Best Practices*. Taylor & Francis, 2020.

[10] T. Mustikawati, Y. A. Yatmo, and P. Atmodiwirjo. "Wayfinding beyond signage: rethinking the role of spatial objects and object relations". In: *IOP Conf Ser Earth Environ Sci*. 2018, p. 12083. DOI: 10.1088/1755-1315/195/1/012083.

[11] *Photography*. http://5s.nlean.com/5sgj/19.html.

[12] I. Popescu et al. "xxx". In: *Acta Tech. Napocensis, Ser. Appl. Math.* xx.xx (xx), pp. xx–xx.

[13] H. Shan et al. "The design analysis of campus guide sign system based on the comparison of Sino-Korea Colleges". In: *Int. Conf. Intell. Interact. Syst. Appl. Springer*. 2017, pp. 427–430.

[14] A. Shi et al. "Construction of university campus public information system of service design". In: *9th Int. Conf. Meas. Technol. Mechatronics Autom. IEEE*. 2017, pp. 427–430.

[15] C. Shuqin et al. "Assessing sustainability on Chinese university campuses: Development of a campus sustainability evaluation system and its application with a case study". In: *J Build Eng* 24 (2019), p. 100747.

[16] C. Simones and A. M. Soares. "Applying to higher education: information sources and choice factors". In: *Stud High Educ* 35 (2010), pp. 371–389.

[17] E. R. Tichauer and H. Gage. "Ergonomic principles basic to hand tool design". In: *Am Ind Hyg Assoc J* 38 (1977), pp. 622–634.

[18] W. Wenyu, L. Jinlong, and D. Zhengqing. "Exploration of visual image design in sports colleges and Universities. Taking the visual image design of Wuhan Sports Institute as an example". In: *Tech Soc Sci J* 14 (2020), p. 117.

[19] X. Yao and M. Xu. "Research on innovative approaches and guidance for urban public space design". In: *Landsc Archit Front* 5 (2017), pp. 18–32.

[20] K. Yenumula et al. "BIM-controlled signage system for building evacuation". In: *Procedia Eng* 118 (2015), pp. 284–289.

[21] X. Zhang. "Field research: A third way for educational management research". In: *US-China Educ Rev* 4 (2005), pp. 20–28.