BEYOND SIGNAGE: RETHINKING WAYFINDING IN BENGALURU'S METRO STATIONS

SAHANA SUNDARARAJAN [a, b] *, LAKSHMI SRINIVASAN [c]

[a] *PeepalDesign, 19th Main, Sector 2, HSR Layout, Bengaluru 560102, India*
[b] *Srishti Manipal Institute of Art, Design and Technology, Govindapura, Yelahanka, Bengaluru 560064, India*
[c] *BITS Design School, Faculty of Design, BSNL Colony, Powai, Mumbai 400076, India*
* *corresponding author: sahanasundar161@gmail.com*

1. Introduction

Public transit systems are the backbone of mobility in cities. With the increased dependency on these systems, good quality public transit spaces and infrastructure are essential for enabling inclusive mobility. Mainstream literature demonstrates that the assessment of efficiency in transit systems has involved evaluating factors like accessibility to destinations, network connectivity and transit mode integration among others [1]. However, the way people experience a space is a function of how they navigate it. Wayfinding is the medium through which people interact with transit systems, thereby forging a deeper connection with their cities. It is defined as the comprehensive process of seeking, exploring and route-planning from one location to another [2]. The different elements of wayfinding design that have been studied are signs, maps, landmarks and tactile or auditory elements.While literature has documented the complexity of wayfinding due to its reliance on both cognitive behavior and information processing [3], its practical implementations are often limited to signages. Transit spaces can truly be navigable when wayfinding systems are considered experientially, with attention drawn to aspects such as sensory cues, spatial perception, existing navigation mental models, crowd movement andindividual mobility behaviors.

Wayfinding design must consider people of diverse physical, social, intellectual and cultural needs. However, this can be challenging as individuals' identities are intersectional in nature. Intersectionality is well-explored in disciplines such as law, racial, gender studies or health but remains unconsidered in wayfinding design. The lack of an intersectional approach induces the risk of creating blind spots or exclusions of specific groups that are affected more deeply, thereby hampering how people navigate and experience cities. Current rapid transit systems like metro stations cater primarily to high-mobility users with healthy bodies and require quick physical movement. Commuters from lower socio-economic backgrounds who are dependent on public transport, non-english or non-native language speakers, first-time commuters and senior citizens are among those who are particularly vulnerable due to the lack of accessible wayfinding systems. Limited mobility and reduced cognition can hinder senior citizens' ability to navigate complex spatial layouts and gather essential travel information [4]. These challenges are exacerbated for senior citizens with intersectional identities, such as first-time commuters, women, or those who cannot speak English or the local language. This results in an intimidation caused by infrastructure, highlighting the need for wayfinding to be made more inclusive by integrating concepts from social, behavioral and cognition studies.

Currently, metro stations connect commercial, residential areas and educational hubs in Bengaluru through its two operational lines, making urban travel more accessible. It is proposed that six new lines will connect unserved parts of the city, leading to the increase in the number of junctions or interchange stations. To ensure accessibility of the city, it is necessary for public transit infrastructure within these stations to be inherently inclusive, especially with respect to the wayfinding systems. The scope of this research focuses on the only interchange station in Bengaluru, which is a critical node and can serve as a case study for emerging stations.

2. Research Questions

Building an inclusive wayfinding system demands a comprehensive approach of study beyond redesigning signage graphics or providing additional mobility support – an area where current research is lacking. All elements within the built environment need to be evaluated from different perspectives to satisfy heterogeneous needs. This research aims to establish a method to study interactions in transit systems through the lens of wayfinding infrastructure and develop a more nuanced approach of evaluation to uncover layers of social exclusion. This was guided by the following fundamental research questions:

- How can wayfinding systems be enhanced to make public transport and therefore, our cities more accessible?
- How can insights from literature and concepts relevant to inclusive design and intersectionality be applied to wayfinding design?

3. Method

Wayfinding studies have outlined multiple frameworks of evaluation in literature. However, to evaluate the inclusivity of an existing system, hybrid or interdisciplinary methods need to be devised to understand users' existing perception, their usage of infrastructure in action and nuances of their specialized needs. The interchange metro station in Bengaluru was considered as a case study and was initially studied through commuter audits and spatial mapping.

Existing wayfinding evaluation frameworks studied the impact of color, graphics or employed usability testing methods [5]. However, in order to let users' perspectives guide the methodology, this research was driven by participatory design activities. Multiple iterations of activities with categories of wayfinding elements (signage, cues, floor markings, announcements, etc.) were designed to gain unique feedback from commuters. Each of these were based on different objectives like understanding the existing perception of signages, elements of signages they responded to, audio-visual cues they sought, all as a function of their identities. The wayfinding elements were classified according to the various identities and their types of perception.

Mobility exclusions are challenging to articulate, especially by those experiencing it. To address this, the methodology needed to identify which individuals were affected, physical areas of impact, and the different factors contributing to this. Commuters in the station were shadowed and their routes were mapped. These route maps were largely based on observation and studied a user's journey through the station as a function of their identities. Additionally, layers of data on interactions with elements, cues sought, movement times, wait times, and detours were recorded. To study their correlation with the space, these maps were overlaid on each other, highlighting distinct spaces or junctions that were 'excluding' users – termed 'conflict zones'. This visualization

technique was a crucial step in achieving a cross-sectional view of physical areas of exclusion during movement.

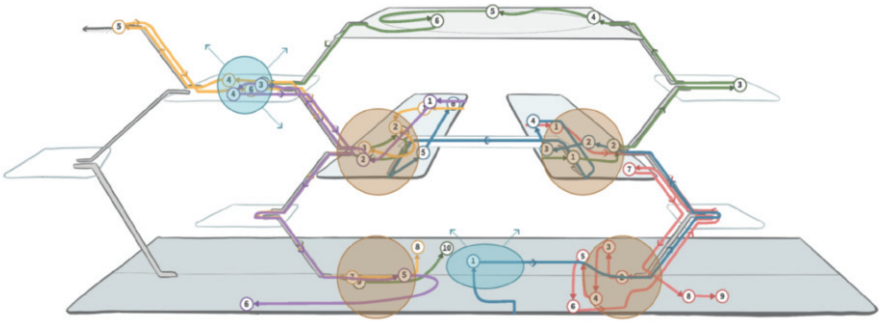

Figure 1. Spatial representation of the Majestic station with mapped user routes overlaid over each other to identify 'conflict zones'

This method revealed insights beyond literature's understanding that elderly commuters struggled with small signage, inconsistent design, large distances [6]. It provided context-specific findings from spatial, signage and identity perspectives. Behavioral nuances like women refraining from asking directions, physical limitations such as senior citizens with canes experiencing fatigue, or pre-existing mental models from other navigational systems - all factors that would have gone unnoticed emerged as significant drivers of navigation patterns. These 'invisible' nuances along with the identified junctions led to a richer understanding of intersectional navigational experiences. To dig deeper into this data and collect intensive qualitative accounts, semi-structured interviews were also conducted.

4. Results

Combining these methodologies bridged the gaps of studying nuanced human navigation and adaptability to existing systems. Though wayfinding principles seem effective in theory, their real impact hinges on execution. This varies according to contexts, geographies and identities of users. Hence, an experiential analysis through a people-centric approach such as this could effectively evaluate the inclusivity of a wayfinding system to build practical solutions to address the challenges.

The findings of this research culminated in a design guidebook that demonstrated methods to reorient existing wayfinding systems to accommodate the needs of elderly commuters. The guidebook consisted of – revised design principles to inform the design of wayfinding components, strategies to design 'conflict zones' in Indian metro stations and a set of dos and don'ts for signage design. While this case study focused on the elderly, the research contributes a nuanced framework of decoding exclusion due to wayfinding in public transit spaces that can be adapted to any context, to identify context-specific 'conflict zones'. It considers intersectional identities and effectively brings out intricacies of their exclusion by identifying its primary areas and causes through spatial visualization. This methodological approach can be scaled to evaluate various types of transit environments as well as different identities to uncover the different forms of exclusions that are present.

References

[1] R. Tamakloe and J. Hong, "Assessing the Efficiency of Integrated Public Transit Stations based on the Concept of Transit-Oriented Development," *Transportmetrica A: Transport Science*, vol. 16, no. 3, pp. 1–49, Apr. 2020, doi: https://doi.org/10.1080/23249935.2020.1753849.

[2] H. Iftikhar, P. Shah, and Y. Luximon, "Human wayfinding behaviour and metrics in complex environments: a systematic literature review," *Architectural Science Review*, pp. 1–12, Jun. 2020, doi: https://doi.org/10.1080/00038628.2020.1777386

[3] A. C. Farr, T. Kleinschmidt, P. Yarlagadda, and K. Mengersen, "Wayfinding: A simple concept, a complex process," *Transport Reviews*, vol. 32, no. 6, pp. 715–743, Aug. 2012, doi: https://doi.org/10.1080/01441647.2012.712555.

[4] K. Solecka, K. Nosal Hoy, and A. Deryło, "Assessment of transport interchanges for the needs of people with reduced mobility," *Travel Behaviour and Society*, vol. 21, pp. 48–56, Jun. 2020, doi: https://doi.org/10.1016/j.tbs.2020.05.004.

[5] K. Bubric, G. Harvey, and T. Pitamber, "A User-Centered Approach to Evaluating Wayfinding Systems in Healthcare," HERD: *Health Environments Research & Design Journal*, p. 193758672095907, Sep. 2020, doi: https://doi.org/10.1177/1937586720959074.

[6] A. D. Mishler and M. B. Neider, "Improving Wayfinding for Older Users With Selective Attention Deficits," *Ergonomics in Design: The Quarterly of Human Factors Applications*, vol. 25, no. 1, pp. 11–16, Nov. 2016, doi: https://doi.org/10.1177/1064804616659992.