

An evaluation of spatial user experience in transportation interiors: Berlin-Südkreuz Station and Wrocław Central Station

Asst. Prof. Dr. Özlem Kurt Çavuş^{1*} 

¹Eskişehir Technical University,
Faculty of Architecture and Design,
Department of Interior Design,
Eskişehir, Türkiye.
ozlemkurt@eskisehir.edu.tr

*Corresponding Author

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Abstract

This study examines user experience (UX) in transportation interiors by conducting a comparative analysis of Berlin Südkreuz Station and Wrocław Central Bus Station. Stations and bus terminals, as key public transportation nodes, have increasingly evolved beyond their infrastructural role into cultural and social spaces where diverse users interact. This study aims to investigate how interior design components influence user perceptions, comfort, and satisfaction. A phenomenological approach is employed, utilizing user data obtained from open-source Google Maps reviews. User comments were transcribed, coded, and analyzed through content analysis to identify recurring themes, including accessibility and wayfinding, spatial comfort and hygiene, aesthetic value, security, additional functions, and impact on urban identity. The study findings highlight themes that stand out as critical factors determining user experience in transportation spaces. The additional amenities and integration of cultural features offered by these spaces contribute to the stations' roles as mediators of urban identity and collective memory. By framing transportation hubs as user-centered public interior spaces, the study emphasizes the importance of holistic and inclusive design strategies. The results are expected to contribute to the literature by suggesting spatial user experience (SUE) themes that can guide future transportation-functional space design.

Keywords: Transportation interior, Transportation space, Station interior, Spatial user experience, Interior design

Extended Abstract

Introduction: As indoor spaces providing access to transportation options, stations and bus terminals have evolved from being merely infrastructural components of public transport to cultural spaces with their own unique social dynamics and diverse experiences. These spaces are environments experienced by various user groups, where both individual needs are met and perceptions that shape the urban image are formed. The design quality of transportation-functional indoor spaces plays a decisive role in creating user satisfaction. Poor ergonomics, inadequate lighting, or ineffective wayfinding can negatively affect spatial perception and increase feelings of insecurity. Beyond functionality, transportation hubs contribute to urban identity and memory and often serve as the first point of contact for visitors in the city. In this respect, spatial design, with its additional functions and cultural elements, can have positive potential effects on the city image and thus support tourism. As Lynch (2010) emphasizes, while environmental image is formed through identity, structure, and meaning, Ponti (2007) emphasizes the sense of belonging created by place identity. In this context, the spatial user experience (SUE) framework offers a holistic approach that links perception, emotion, and interaction to spatial design. Despite the growing literature addressing the physical, sensory, and psychological aspects of public interiors, studies focusing on user experience in transportation spaces as public interiors remain limited. This study aims to fill this gap by analyzing user evaluations in two current interior design projects: Berlin Südkreuz Station and Wrocław Central Bus Terminal. Through content analysis of real user evaluations on Google Maps, spatial themes reflecting user perceptions are identified, providing insights for future transportation hub design.

Purpose and scope: The main objective of this study is to evaluate spatial user experience (SUE) in transportation interiors, focusing particularly on station and terminal interiors. Highlighting that transportation hubs are not only infrastructural elements but also cultural and social spaces, the study aims to identify which sensory elements influence user perceptions and responses. The scope of the study is to reveal the themes determining user experience in transportation-functional interiors through a comparative analysis of two high-user transportation hubs from Europe and content analysis of user evaluations. These are Berlin Südkreuz Station in Germany and Wrocław Central Bus Terminal

in Poland. Both stations were selected as samples of recently constructed and renovated projects serving as important transfer points in their respective regions. Google Maps reviews, an open-source user-generated data source, were used to capture real experiences and perceptions. Reviews from the past six years were transcribed and analyzed using content analysis to identify recurring themes related to user experience. This study aims to contribute to the literature by generating thematic data on spatial user experience in transportation interiors, providing guidance for future design practices and decision-making processes.

Method: This study adopts a qualitative research design to evaluate user experience in transportation interiors. A phenomenological approach is used to capture user perceptions and lived experiences in transportation-functional interiors. In the first stage of the study, visual and published documents from two sample projects were collected for comparative analysis: Berlin Südkreuz Station and Wrocław Central Bus Terminal. Both stations are examples of significant transportation-functional projects that have been built or renovated in recent years. The data collection and analysis methods chosen in the study aim to obtain themes regarding how physical and sensory design elements affect user perception. Open-source user data obtained from Google Maps reviews was used as the primary dataset. To ensure currency in the findings, reviews entered or updated within the last six years were included. A content analysis procedure was followed to obtain the findings. Transcription files were compiled, user-generated reviews were coded according to their recurring content, and systematically analyzed. The codes were then grouped under broader thematic categories. Each review was referenced with a user number to ensure traceability within the dataset while maintaining anonymity.

Findings and conclusion: Analysis of user-generated data revealed common themes shaping spatial user experience in transportation interiors. These themes include accessibility and wayfinding, spatial comfort and hygiene, aesthetic value, safety, additional functions, and impact on urban identity. Accessibility stands out as one of the most critical factors in user evaluations; users frequently emphasize the importance of elevators, ramps, and barrier-free circulation systems. Functional deficiencies in these areas negatively affect user experience. Wayfinding is one of the most frequently mentioned spatial experience themes by users. Clear signage, information systems in different languages, and consistent color coding are noted to significantly reduce cognitive load and improve spatial readability. Lighting and vertical circulation solutions (elevators) stand out as elements shaping perceptions of accessibility and safety. The role of sensory design and safety measures in fostering psychological well-being and a sense of security is highlighted. The integration of amenities such as hygiene, maintenance, and retail or cultural elements into these spaces is closely linked to user experience. Examples such as the public piano in Berlin's Südkreuz demonstrate that transportation hubs can transcend their transportation functions, offering opportunities for social interaction and cultural expression. Beyond spatial comfort, this study considers transportation interiors as gateways contributing to urban identity and memory. Consequently, it emphasizes that transportation hubs are not merely infrastructural nodal points, but also symbolic and cultural spaces that influence the urban image.

Keywords: Transportation interior, Transportation space, Station interior, Spatial user experience, Interior design

INTRODUCTION

Stations and terminals, which are places where basic actions such as waiting for public transportation take place, are not only infrastructural elements but also significant places where people spend considerable time, representing a crucial user experience. They have transformed into spaces experienced by diverse user profiles, where daily interactions occur, and which possess social dynamics. The fundamental reason for this transformation is the need for spatial quality arising from the length and variety of time users spend in these areas while waiting for public transportation. Transportation-related indoor spaces are not only functional transition areas but also environments where users directly interact with the physical environment during their waiting times, and this interaction shapes their overall experience. During the waiting process, interior design components such as the ergonomics of seating elements, lighting conditions, and the effectiveness of wayfinding and information systems directly affect the user experience. Approaching public transportation-related indoor spaces from a user-centered perspective is a vital necessity to improve the waiting experience and create safer, more comfortable, and more accessible environments. As public indoor spaces characterized by high user circulation, public transportation interiors affect the well-being of users as an important part of daily life. In this context, user experience has become increasingly important in the design of multi-layered station and terminal structures. Studies in the literature emphasize the critical role of sensory design elements, particularly acoustics and lighting quality, in enhancing passenger comfort (Aktop-Maden & Avlar, 2017: 18). Similarly, studies have shown that physical design components, such as seating arrangements and lighting conditions in station interiors, have a decisive impact on user experience, especially during long waiting times.

Such interiors require multidisciplinary design approaches at different scales; the design process is not limited to architects but also includes interior designers, graphic designers, landscape architects, lighting designers, crowd management specialists, and even industrial designers (Öztürk, 2020: 20). These findings demonstrate that sensory and physical factors such as lighting, ergonomics, accessibility, and wayfinding directly affect users' spatial perceptions and psychological states in transportation-oriented public interiors. Therefore, adopting user-centered approaches in the design of transportation-functional public spaces emerges as a requirement to ensure a positive spatial experience.

Transportation areas play a significant role in shaping urban identity (image), enhancing the daily comfort of city dwellers, and contributing to the tourism mobility. Lynch (2010: 8) states that the environmental image can be divided into three components: identity, structure, and meaning. Similarly, Ponti (2007) defines place identity as a sense of belonging arising from the intrinsic identity of a place. Both place sense and place identity, as a multi-layered process, are important components of place discourse (Carter et al., 2007: 756). Furthermore, it is emphasized that passengers' perceptions of safety are closely related to the physical and social organization of the space; inadequate maintenance, lack of navigation systems, or physical ambiguities can foster feelings of insecurity (Evans, 2009: 372). It is observed that some terminals and stations that have become city landmarks can be attractions that enhance the city's tourist value through their architectural design elements, additional functions, and artistic features. Station interiors, serving as the first point of contact with the city for both domestic and international visitors, function as the face of the city, act as intermediaries of urban identity, and contribute to the construction of collective urban memory.

The relevant literature reveals that the design of transportation areas and interior elements plays a significant role in the perception of the urban environment. A study on metro stations in Istanbul showed that the sensory and physical design of metro interiors directly affects user satisfaction, creating a positive perception of the city among both tourists and locals (Tunç, 2007: 104). While a significant number of studies examine the physical and sensory design elements of public spaces, studies focusing specifically on user experience in transportation interiors are more limited. This study aims to fill this gap by approaching transportation interiors from a user experience perspective, conducting a comparative analysis of selected sample station interiors, and revealing user-centered design themes. The objectives of the study are to comparatively evaluate station and terminal interior designs focusing on user experience through two sample spaces, and to propose spatial user experience themes suitable for transportation environments. Berlin Südkreuz Station in Germany, selected as one of the sample areas for this study, serves as a significant example with its user-friendly features added during its renovation project in 2020. This multi-functional transfer station houses both train and bus services, as well as incorporating additional functions. The second sample project, the Wrocław Bus Terminal in Poland, opened in 2017 and stands out with its user-centered design approach, emphasizing well-organized and accessible design criteria. The findings of this study are expected to contribute to the literature by generating spatial experience themes that can shed light on the future design of public transportation environments.

THE CONCEPT OF SPATIAL USER EXPERIENCE (SUE)

In the design process of a space or product, the individuals who engage with that space or product are defined as "users." The quality of spatial design can be evaluated through the positive or negative feedback provided by users following their experiences. User experience is grounded in the perceptions, habits, and acquisitions that emerge during the use of a space. This experience reveals the extent to which the design responds to user needs. In essence, user experience represents the interactive practices between action and environment, encompassing space-oriented objects, products, and services, and, from another perspective, constitutes the final output of design (Nazlı Erap, 2022: 27). According to Norman, who first introduced the concept of user experience, it is defined as a series of interconnected and integrated experiences (Norman, 2010). The International Organization for Standardization (ISO) defines user experience as "a person's perceptions and responses resulting from the use and/or anticipated use of a product, system, or service" (ISO, 2010). User experience (UX) is a strange concept that has been readily embraced by the human-computer interaction (HCI) community, practitioners, and researchers, yet repeatedly criticized for being vague, elusive, and ephemeral (Hassenzahl & Tractinsky, 2006: 92).

User experience (UX) is defined as the holistic expression of the perceptions, emotions, and responses that emerge from an individual's interaction with a product, system, or service. In recent years, this concept has gained increasing importance, particularly in the context of public spaces and transportation systems. Perceptions related to interior atmosphere are directly linked to individuals' knowledge of the physical characteristics of a space, and this knowledge plays a decisive role in the evaluation of that space. Such evaluations made by users guide and shape their behavioral patterns within the environment. Spatial perception, in turn, is associated with the individual's short- or long-term experiences with the space or its surroundings and with the mental recall of these experiences. Based on a comprehensive review of the literature from multiple disciplines, primarily product design and human-computer interaction, a six-dimensional Spatial User Experience (SUE) model has been defined as the main factors of SUE by Juliá Nehme et al. (2020: 7). These dimensions are divided into two groups: (1) Ergonomic-Instrumental, Spatial Cognition, Physical Conformity and Environmental Conformity; and (2) Affective, Affective Response, Spatial Appreciation and Proxemic. In high-traffic environments such as metro stations, enhancing user experience has become essential to meet both physical and psychological needs. In this regard, user experience represents a holistic construct that extends beyond functionality to encompass multiple layers, including aesthetics, ergonomics, accessibility, and sensory perception (Erap et al., 2021: 341). SUE in metro stations and other transportation-oriented spaces is shaped by the interaction between individuals and the physical as well as sensory design elements. Components such as wayfinding systems, lighting, and aesthetic qualities influence the quality of experience by enhancing user satisfaction and the sense of belonging. User-centered and holistic design approaches transform station interiors from being mere transit spaces into social environments that are integrated with the city.

Accessibility, Wayfinding and Sensory Design in Transportation Interiors

An examination of approaches concerning individuals with disabilities reveals that awareness of the social exclusion and denial of rights faced by such groups began to emerge in the mid-20th century (Yelçe, 2020: 16). Addressing a societal issue such as disability from the perspective of spatial accessibility has been highlighted in the literature as essential for identifying problems and proposing solutions (Yıldırım et al., 2021: 196). In transportation hubs, accessibility design constitutes a fundamental component of the experiential relationship established between the space and its users. Physical access provisions, including elevators, ramps, and tactile floor surfaces, not only support mobility but also directly shape emotion-based perceptions of the space, such as perceivability and user safety. The perception of a terminal or station as sensorially accessible positively affects users' emotional experiences, thereby enhancing overall satisfaction levels (Vega et al., 2025: 12). Wayfinding systems directly contribute to the cognitive processes of SUE. Lynch's (1964: 101) theory of the image of the city and Passini's (1984: 163) wayfinding theory indicate that environmental cues - such as landmarks, nodes, and signage- facilitate the formation of mental maps within the space and help users understand the environment, thereby reducing cognitive load. Critical architectural determinants of spatial cognition encompass internal environmental information, layout features, and accessibility, expressed through components such as facility locations, landmarks, signage, spatial differentiation, mapping, and lighting (Wei et al., 2025: 2). For qualified wayfinding within metro station design, the legibility and visual coherence of signage must be strengthened to facilitate quick and intuitive recognition by users of varying age demographics (Wei et al., 2025: 22).

Visual environment design and sensory atmosphere are spatial parameters that significantly impact user experience. Elements such as color, texture, material, atmospheric qualities, and spatial constraints act as visual factors that influence users' stress levels, mood, and overall experience. Wu and Park (2025: 1) highlight cultural differences in spatial perception, noting that Chinese participants preferred narrower, brighter, cool-colored passages for improved orientation and focus, while Korean participants favored wider, darker, warm-colored passages for greater accessibility and stability. Sensory elements have a significant impact on user experience in interaction with a space. For instance, in transportation interiors, physical factors such as the absence of natural light due to being underground, changes in ambient temperature, and the cold sensation conveyed by concrete materials can play a decisive role in shaping users' positive or negative perceptions of the environment. An atmospheric perception also involves judgements beyond the five Aristotelian senses, such as sensations of orientation, gravity, balance, stability, motion, duration, continuity, scale and illumination

(Pallasma, 2014: 231). The sensory effects present within a space indicate not only its physical accessibility but also its accessibility in terms of psychological experience. The use of technology also emerges as a necessity for an accessible spatial experience. Technological wayfinding solutions, such as mobile navigation applications and auditory or tactile information systems, enable users to navigate spaces independently and safely (Mimra et al., 2025: 6). In addition to functionally supporting accessibility, these systems can enhance the quality of the relationship between users and the environment by promoting psychological well-being.

METHODOLOGY

Research Model and Method

This study employs a two-stage methodology. In the first stage, visual and written documents related to the selected sample station locations were classified using visual comparative analysis, and a comparison table of visual and written materials containing project design features were presented. In the second stage, user experience research was conducted using a phenomenological approach with open-source online user reviews. User experience research has become an effective approach for obtaining data to understand user behavior and develop contemporary spatial design strategies. In this study, the phenomenology design, one of the qualitative research methods, was employed to analyze user experiences in sample transportation interiors based on user feedback. The transportation interiors selected as study sample are Berlin Südkreuz Station in Germany and Wroclaw Bus Terminal in Poland. Phenomenology is a qualitative research design that gathers information about a phenomenon by consulting the perspectives of individuals who have directly experienced it (Çapar & Ceylan, 2022: 295). Within this context, the design of interior spaces in transportation hubs and associated user experiences were examined through users' online Google reviews. The phenomenological approach was selected as it provides an appropriate means to obtain in-depth, experience-based knowledge and interpret the lived experiences of users. Google Maps reviews of the selected stations were treated as written documents reflecting user perspectives. User comments directly related to user experience were extracted separately for each sample station and transcribed. These transcripts were systematically coded by the researcher using a qualitative data analysis approach, and the resulting themes were organized and presented in a comparative table. The selection criterion for the comments was that they had been posted or updated within the past five years. This approach aimed to obtain up-to-date information regarding the current conditions of both stations.

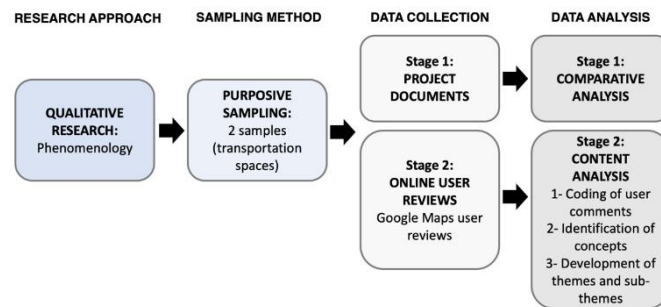


Figure 1. Graphical abstract of study

The use of online open-source user reviews as a primary data source is supported by studies that increasingly recognize digital platforms as valuable repositories of unsolicited, natural user feedback (Song et al., 2020: 1; Liu & Xiao, 2021: 1; Chen & Cheng, 2024: 1). Such reviews capture firsthand experiences expressed by users in their own language, thus providing rich qualitative data that is less affected by researcher intervention compared to traditional interviews or surveys. Additionally, studies have highlighted the effectiveness of online reviews, particularly in environmental and spatial experience research, where users freely report their perceptions of comfort, accessibility, and satisfaction within specific built environments. Google Maps, as a widely known and easily accessible platform, is frequently used. It has become the first-line platform for users seeking information about any given location. This digital mapping service provides users with a medium to post ratings and reviews about various organizations (Chen & Cheng, 2024: 4).

The aim of this study is to investigate the impact of interior design elements on user experience in two comprehensive transportation hub samples (Berlin-Südkreuz Station and Wroclaw Terminal) based on user-generated data. The key criteria for selecting these two transportation hubs in different European countries were that the design projects are recent projects constructed by professional experts within the last decade and that they are renovation projects at existing stations as part of a contemporary spatial design initiative. Additionally, their location as high-user transfer stations connecting different cities and countries in Europe was another selection criterion. Both stations function as important hubs in their respective locations. During the analysis process, themes derived from user reviews on Google Reviews were supported by station-specific visual and informational documents to provide contextual support. This approach aims to provide a user-experience-focused analytical framework for transportation hubs with different design characteristics, offering insights into how spatial functionality and interior design features influence passengers' perceptions and behaviors.

Sample Selection

This study aims to select transportation space projects incorporating contemporary design approaches as samples for evaluating the user's interior experience in transportation spaces. For this aim, two different specially designed transportation space projects were selected using a purposeful sampling method based on certain criteria. The logic and power of purposeful sampling lie in selecting information-rich cases for study in depth (Patton, 2002: 230). The process of selection of the samples was guided by the following criteria:

- To be designed by a professional architectural design office,
- Access to documented project information,
- The spatial design project should include innovative design solutions specifically regarding wayfinding and accessibility.

Within this scope, sample transportation hub projects from each of two different countries in Europe that meet these criteria were selected.

Sample Station 1: Berlin-Südkreuz Station

The station Berlin Südkreuz, which was determined as the first sample, is located south of Berlin's city center in the Schöneberg district in Germany. Long-distance trains, regional trains, the S-Bahn, and buses stop here. From Südkreuz, travel to the inner city takes about 20 minutes (The Official Website of Berlin, 2025). Berlin-Südkreuz Station is one of 16 future stations nationwide (Germany) at which DB is testing new concepts and services. Berlin-Südkreuz station was the scene of improvements in 2020 (Architonic, 2025). This station underwent a renovation project in 2020. Signaling guidance system with identity-creating spatial sculpture "The Flow". In close collaboration with the Berlin-based design agency No Pink Studio, a space-defining intervention was created at Berlin's Südkreuz railway station that combines functionality with design conciseness. The aim was to develop an identity-creating signage system that makes the complex spatial structure of the transport hub intuitively tangible (Schmidt & Pütz, 2021). The project was conceived and executed with notable dedication and a strong sense of commitment by all parties involved (Architonic, 2025). The main element is a consistent color concept that unfolds across all levels, from the S-Bahn entrances to the platforms. Visual continuity guides passengers naturally within the space (Schmidt & Pütz, 2021). This color-based design approach can be seen in Figure 2.

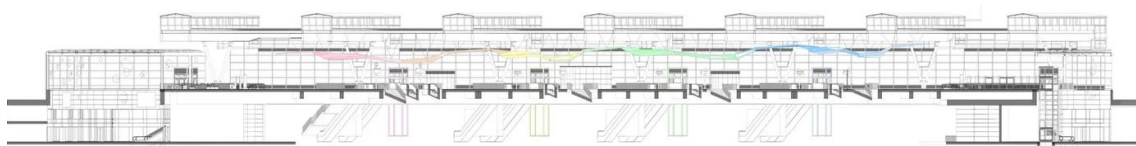


Figure 2. Elevation of the renovation project of Berlin-Südkreuz Station

According to the project information obtained, thanks to the precise interaction of the professionals involved, a solution was achieved that met both high functional requirements and design demands. The project resulted in an innovative navigation system used by more than 200,000 passengers daily. Due to its conceptual design strength and consistent implementation, the project was honored with a "Special Mention" at the 2022 German

Design Award (Schmidt & Pütz, 2021). Berlin is a city shaped by layered transport histories. Emerging as a trading center in the 13th century, the city expanded rapidly with industrialization and the development of extensive railway networks in the 19th century. In the 20th century, the city was divided following World War II, leading to the separation of transport systems in East and West Berlin. After the fall of the Berlin Wall in 1989, these infrastructures were reintegrated (Ladd, 2028).

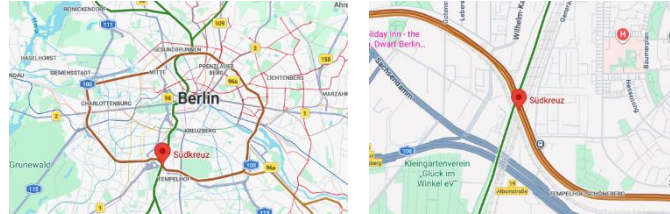


Figure 3. Map of Berlin City

Sample Station 2: Wrocław Central Bus Station

Located in the Huby residential district of Wrocław, Poland. Wrocław Central Bus Terminal (Dworzec Wrocław) is located on the second basement floor of the Wroclavia shopping mall and is immediately adjacent to Wrocław Główny train station. Officially opened in 2017, the terminal represents the only underground PKS bus terminal built in Poland. The facility forms part of a wider urban development initiative, with the Wroclavia shopping center opening in October 2017 and the bus terminal opening shortly after. The new Wrocław bus station was built on the minus two level of the Wroclavia shopping center. It is the only PKS bus station in Poland to be built underground, with 11 departure platforms, three arrival platforms, and one reserve platform. The terminal has the capacity to accommodate 1,000 buses and serve several thousand passengers daily. It was built with the expectation that it would serve up to 5.4 million people annually (Pajęzek, 2017). The Polbus bus station is a key part of the multifunctional Wroclavia building. The interiors were designed with attention to clarity and functionality of the space, as well as the durability of the materials used (ATP Asymetria, 2017).

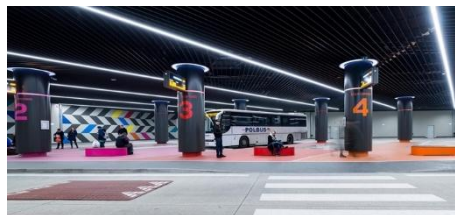


Figure 4. Wrocław Central Bus Terminal

Wrocław, historically known as Breslau, developed as a key Central European trade and transport hub from the medieval period, shaped by its position along the Oder River. Rapid industrialization in the 19th century brought extensive rail infrastructure and station development. Following the devastation of World War II and subsequent border changes, the city underwent major reconstruction under Polish administration (University of Lodz, 2025).

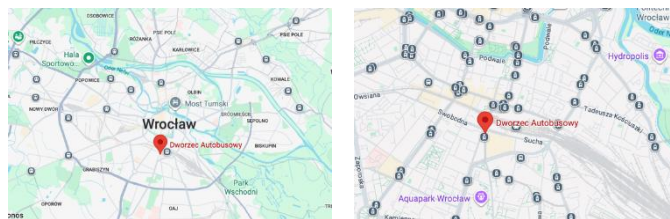


Figure 5. Map of Wrocław City

Data Collection

In the data collection process, publicly accessible user reviews from Google Maps were utilized. For both samples, comments from 2020 to date were used by accessing Google Maps in 2025 and 2026. Since the first sample underwent a renovation project in 2020 and the second sample was completed in 2017, data from the last 6 years was used for both samples. User reviews for each station available on Google Maps were gathered,

transcribed, and subjected to content analysis to extract relevant themes. Two separate sample terminal users were coded internally as P1, P2, and so on. Following the transcription of the reviews, thematic coding was conducted, resulting in the identification of key themes related to the sampled transportation hubs, including design, accessibility, wayfinding, safety, and functional comfort etc. These themes were subsequently evaluated as factors directly influencing user experience within transportation facilities.

Data Analysis


In the first stage of the study, visual and written data were collected and used to create comparative analysis tables. The tables were organized according to the content of the information. In the second stage of the findings, online user comments were selected according to specific criteria and subjected to content analysis. Content analysis is defined as a research method used to make replicable and valid inferences from data to the context of their use (Hansen, 2003: 55). Content analysis can be used with a wide variety of data sources, including textual data, visual stimuli (e.g., photographs/videos), and audio data (Stemler, 2015: 1). The collected user reviews were transcribed and analyzed using the content analysis method defined by Krippendorff (2018: 411), a systematic qualitative approach aimed at identifying patterns and drawing valid, replicable inferences from textual data within its context. The data were first coded inductively to extract recurring themes directly related to user experience in the sampled stations. Based on these identified themes, a comparative evaluation table was developed, enabling both station-specific and cross-case analyses. This dual approach allowed the influence of key themes such as design, accessibility, wayfinding, safety, and functional comfort on user experience to be examined individually for each station and comparatively across the selected transportation hubs. By systematically contrasting these findings, differences in spatial design and user experience between the case study stations were revealed. This comparative analysis facilitated the identification of each station’s strengths and weaknesses, thereby offering insights into how interior design elements affect user satisfaction. The use of content analysis in this study aligns with its established role in environmental behavior research, where it is frequently applied to interpret unstructured, user-generated data.

FINDINGS

Sample Station 1: Berlin-Südkreuz Station

The aim of the project was to create a pleasant place for travellers and residents alike to linger. According to Deutsche Bahn management, the travellers like to use the furniture. The primary objective in this sample station was to design an inviting environment that encourages both travelers and residents to spend time in the space. Key features include a triangular seating island, an expansive flowerbed with a lawn enclosed by high-quality seating furniture, and undulating seating elements integrated with the steps. Hardwood was intentionally selected for its tactile and visual qualities, which enhance the welcoming character of the area. The project was conceived and executed with notable dedication and a strong sense of commitment by all parties involved (Architonic, 2025). The following images illustrate the general parts of Berlin Südkreuz Station, highlighting details related to accessibility, wayfinding, and lighting (Table 1).

Table 1. Berlin-Südkreuz Station interiors

Project Name	Spatial Description	Images
Berlin-Südkreuz Station	Station interiors-wayfinding and lightning	

In the main areas shown in Table 1, an open ceiling was used to reveal the steel and glass construction details. During the daytime, natural lighting is utilized, while artificial lighting is provided by the quad spotlight

fixtures on the ceiling to create general illumination. Different color accents are applied in the wayfinding design throughout the space. In the elongated main hall, areas corresponding to different platforms can be identified through the parametrically curved ceiling element and other vertical wayfinding components, each assigned distinct color codes. For example, in the area where the ceiling form, elevator, and vertical signage are pink, Platforms 11-12 and the corresponding S-Bahn lines are located. Photographs of the interior and wayfinding elements are presented below (Table 2).

Table 2. Berlin-Südkreuz Station interiors

Project Name	Spatial Description	Images
Berlin-Südkreuz Station	Station interiors- wayfinding, lightning and waiting areas	

In Table 2, the vertical wayfinding elements (signage) indicating train lines are color-coded according to their respective areas. The third image in Table 2 depicts the interior space of the station where activities such as shopping, waiting, and social interaction occur. This waiting hall is surrounded by retail outlets, including food and beverage shops and a supermarket. In this image, a publicly accessible piano is located at the center of the space, along with a person providing piano performances for station users. This entirely spontaneous activity offers a spatial opportunity for social interaction, which has a tangible impact on station users. Below, the exterior area containing the station’s bus stops is shown, along with urban furniture designed as part of the station renovation project in the surrounding environment.

Table 3. Berlin-Südkreuz Station bus perrons and exterior/environmental design

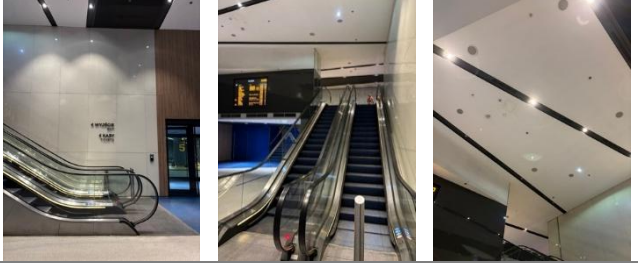
Project Name	Spatial Description	Images
Berlin-Südkreuz Station	Station exterior and environmental design	

Table 3 presents the bus platforms and the exterior spatial arrangements of the station. At this location, the bus platforms are designed as open-air spaces, reflecting a functional approach to circulation and accessibility. The urban furniture positioned in front of the station’s main entrance was introduced within the scope of the renovation project, enhancing the public realm by providing areas for rest, orientation, and social interaction. These design interventions not only improve the functional use of the exterior environment but also contribute to the overall spatial quality and user experience of the station.

Sample Station 2: Wroclaw Central Bus Station

Table 4 illustrates the interior spaces of the Wroclaw Central Bus Station, highlighting details related to accessibility, wayfinding, and lighting conditions. In terms of spatial accessibility, vertical circulation is facilitated through escalators, positioned to connect the street level with the bus platforms efficiently. At the lower level of the escalator, essential wayfinding signage is provided in both Polish and English, ensuring clarity and ease of navigation for international users. The lighting design primarily employs spot fixtures to create a consistent and evenly distributed illumination across the interior. The overall spatial atmosphere is reinforced with light-colored finishes on ceilings, walls, and flooring, generating a sense of spaciousness, while dark blue accents and wooden cladding serve as secondary design elements that introduce contrast and warmth into the environment.

Table 4. Wrocław Central Bus Station interiors

Project Name	Spatial Description	Images
Wrocław Central Bus Station	Station interiors- wayfinding and lightning	

In comparison to Berlin Südkreuz Station, where spatial identity is reinforced through large-scale structural transparency and vertical spatial color coding, Wrocław Central Bus Station demonstrates a different design approach. As illustrated in Table 5, the station integrates wayfinding, lighting, and waiting areas with a more restrained yet coherent visual language. The vertical surface behind the fixed seating elements in the waiting zone employs a striking shade of blue, which is further extended to the floor wayfinding system to create visual continuity. This design strategy not only provides aesthetic integrity but also enhances users’ cognitive mapping of the environment by clearly indicating pathways to key areas such as “arrivals” and “exits”. Moreover, a digital board projecting real-time bus schedules significantly improves information accessibility, fostering both functional efficiency and user comfort. Thus, while Berlin Südkreuz emphasizes spatial orientation through expansive structural gestures and color-coded nodes, Wrocław Central Bus Station adopts a more enclosed, interior-focused strategy that leverages color, digital media, and compact spatial cues to achieve accessibility and user satisfaction.

Table 5. Wrocław Central Bus Station Interiors


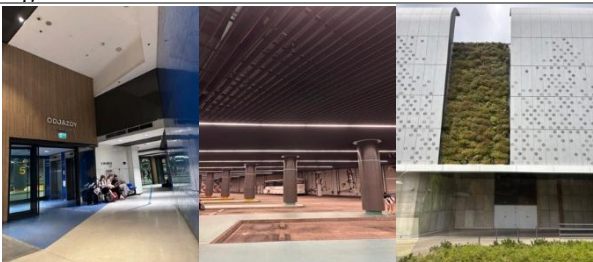
Project Name	Spatial Description	Images
Wrocław Central Bus Station	Station interiors- wayfinding, lightning and waiting areas	




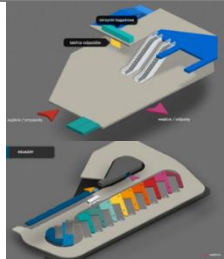
Table 6 illustrates several key spatial components of Wrocław Central Bus Station and its immediate context. The first image shows the “departures” gate, located directly opposite the escalators, which provides users with fast and convenient access to the bus platforms. The second image depicts the platform area, where artistic wall murals have been integrated as aesthetic interventions. The floor is accentuated with a light blue tone, while linear LED fixtures installed on the open-system ceiling generate general illumination across the space. The final image presents a detail of the Wroclavia Shopping Center façade, which includes the bus station. The building is characterized by a contemporary envelope design incorporating a green wall and permeable façade elements, thereby establishing a visually distinctive presence within its urban context.

Table 6. Wrocław Central Bus Station-bus perrons and exterior/environmental design

Project Name	Spatial Description	Images
Wrocław Central Bus Station	Bus perrons and exterior/ environmental design	

When compared with Berlin-Südkreuz Station, spatial and architectural strategies of the two hubs reveal different approaches to public identity and user experience. Berlin-Südkreuz emphasizes structural transparency through its extensive use of steel and glass construction, while relying heavily on natural daylight. By contrast, Wrocław Central Bus Station is integrated into a commercial complex, and its design highlights a hybrid identity-functioning simultaneously as a transport hub and a retail environment. The use of green walls and permeable façades reflects a contemporary emphasis on sustainability and urban integration, whereas Berlin-Südkreuz projects an infrastructural clarity rooted in mobility and efficiency. Thus, while both stations operate as major nodes within their respective urban networks, their architectural expressions represent distinct interpretations of accessibility, atmosphere, and the symbolic role of transport infrastructure in shaping urban identity. Table 7 presents the fundamental data of the sampled transport hubs, including their design and conceptual approaches, connectivity, urban context diagrams, and architectural floor plans, in a comparative format. As illustrated in the table, both stations serve as significant nodes of urban mobility within the European Union, despite being located in different countries and cities.

Table 7. Comparative analysis of sample stations

	Berlin-Südkreuz Station	Wrocław Central Bus Station
Design Approaches and Concept	The aim was to create a pleasant place for travelers and residents alike to linger. A triangular seating island, a large flowerbed whose lawn is enclosed by high-quality seating furniture, and wavy seating elements that nestle against the steps. Hardwood was deliberately chosen because its feel and look make it more inviting. All those involved planned and implemented the project with commitment and heart and soul (Architonic, 2025).	The Wrocław Central Bus Station (Polbus bus station) is a key part of the multifunctional Wrocławia building. The interiors were designed with attention to clarity and functionality of the space, as well as the durability of the materials used (ATP Asymetria, 2017).
Links	The train station Berlin Südkreuz is located south of Berlin's city center in the Schöneberg district. Long distance trains as well as regional trains and the S-Bahn stop here. From Südkreuz, travel to the inner city takes about 20 minutes (The Official Website of Berlin, 2025).	The most modern facility of its kind in this part of Europe, located right next to the main railway station and the public transport hub at the intersection of Borowska and Ślężna streets (Dworzec Wrocław, 2025).
Close Environment Map	 Südkreuz Station	 Wrocław Central Bus Station
Plan	 Südkreuz Station Plan	 Wrocław Central Bus Station Plan

Content Analysis Themes of User Reviews

In the scope of this study, Google Maps reviews, used as an open data source, were extracted, and compiled into transcript files. In the subsequent stage, these transcripts containing user reviews were carefully examined, and a content analysis was conducted. The table below presents the themes identified through this analysis, along with the corresponding user comments coded under each theme. The user number associated with each comment is indicated at the end of the respective entry. The comments were accessed from the Google Maps pages of the relevant sample stations in 2025 and 2026 (Google Maps Südkreuz, 2025; Google Maps Wrocław Central Bus Station, 2025).

Table 8. Content analysis themes based on Google Maps comments

Content analysis themes	Berlin-Südkreuz Station Coded Google Maps Reviews	Wroclaw Central Bus Station Coded Google Maps Reviews
Theme 1: Accessibility and Wayfinding	<p>“...Both elevators and escalators broken.” (P1)</p> <p>“It’s a major S-Bahn regional and long-distance station.” (P2)</p> <p>“This “future station” gets one star for its mostly dysfunctional accessibility-floor lights that blink (occupancy indicators are now off again), a rotating solar panel, and other gimmicks were sufficient.” (P3)</p> <p>“...Südkreuz is more of a regional train station, offering good transfer options to the S-Bahn, long-distance buses, and local BVG buses.” (P5)</p> <p>“Escalators are broken, one elevator is out of service, and the other is closed for repairs. Accessibility? None.” (P8)</p> <p>“Excellent connections...” (P10)</p> <p>“As a frequent traveler, I can’t get used to this station. I’ve found the strange architecture of the intersection of long-distance and S-Bahn trains to be unsightly for years.” (P12)</p> <p>“Even if you are visiting the station for the first time, it is quite easy to reach.” (P16)</p> <p>“...well-serviced and convenient train station”. (P18)</p> <p>“It’s huge and inconvenient if you don’t know your way around. It’s hard to find a bus.” (P17)</p>	<p>“...A public transport hub is located nearby... It is well-marked...” (P2)</p> <p>“It was easy to find my Flixbus here.” (P4)</p> <p>“Great centre, everything is nearby.” (P6)</p> <p>“The entrance is a bit confusing. Yes, it’s on the first floor of Wroclavia, on the northeast side, I think.” (P7)</p> <p>“Easy communication.” (P9)</p> <p>“What interested me: the toilet room and Wi-Fi. toilet: If you want to pay with a card... then you’ll have to go to the ticket office :)” (P1)</p> <p>“Ticket offices and information desks are located at the top of the station, while platforms are located at the very bottom, well-marked...” (P12)</p> <p>“Public transport stops, the train station, and a taxi rank are nearby. The market square is just a few hundred meters away.” (P14)</p> <p>“...and is well-located, right under the shopping mall and close to the train station.” (P18)</p>
Theme 2: Spatial comfort and Hygiene	<p>“This large station is neither comfortable, safe, clean, nor inviting.” (P2)</p> <p>“Homeless people are urinating on the wall in front of the bus stop, so everything is spilling onto the road. The station itself is completely filthy and covered in bird droppings.” (P6)</p> <p>“...It smells like vomit, urine, and alcohol.” (P9)</p> <p>“Unfortunately, the station hasn’t been this clean and hygienic in the last two years.” (P11)</p> <p>“I never expected to see such a dirty train station... We had a four-hour layover to catch a bus, and there wasn’t even a covered, heated waiting area; we were freezing...” (P20)</p>	<p>“There’s nowhere to sit while waiting. People are standing in the adjacent shopping mall. The restrooms are poorly ventilated.” (P5)</p> <p>“...It is well-marked and clean.” (P2)</p> <p>“...and clean.” (P12)</p> <p>“...Passengers can wait for their bus in the warm basement of the Wroclavia shopping center.” (P14)</p> <p>“...the toilet is a disgrace... it’s dirty, smelly, and filthy. The toilet is generally very dilapidated and neglected.” (P18)</p>
Theme 3: Aesthetic Value	<p>“...a First-Class station...” (P1)</p> <p>“Südkreuz station itself has good transport connections and is quite “new,” but otherwise, it’s nothing spectacular.” (P4)</p> <p>“Beautiful train station...” (P7)</p> <p>“The train station is truly wonderful.” (P10)</p> <p>“A modern station...” (P14)</p> <p>“Beautiful, well-serviced and convenient train station”. (P18)</p>	<p>“The modern PKS bus station...” (P2)</p> <p>“The station is great...” (P3)</p> <p>“Cool.” (P8)</p> <p>“New, Modern.” (P11)</p> <p>“A perfectly designed bus station...” (P14)</p> <p>“Beautiful, comfortable, modern.” (P15)</p> <p>“Beautiful, useful.” (P16)</p> <p>“The station looks nice...” (P18)</p>
Theme 4: Security	<p>“Every day, drunk people hang around in front of the entrance, harassing passersby. We have to call the police almost daily.” (P6)</p> <p>“All the seats are occupied by smelly, drunk, and bullying men... There’s federal police station there, but the men and women there don’t seem to do anything.” (P9)</p> <p>“In my opinion, there’s insufficient security outside the station, especially around the bus station. You’ll be harassed and sometimes threatened by drunk people...” (P10)</p> <p>“What’s also very unpleasant and disgusting is the sight of all the people smoking and drinking alcohol in the mornings.” (P11)</p> <p>“It was filthy and very dangerous at 1 a.m.” (P20)</p>	<p>“...but the impression is constantly spoiled by a less-than-adequate guard. He’s arrogant, oversteps personal boundaries, is tall, has gray hair, and is 50+ years old. Everything else is fine.” (P3)</p>

Theme 5: Additional Functions (Art/shopping/s ocial interaction etc.)	“The Edeka supermarket, open 7 days a week, is good.” (P1) “...good shopping opportunities, and friendly staff.” (P10) “You can really find everything you need there...” (P11) “...and you can also do a little shopping.” (P12) “...you can go shopping and there are many options for food...” (P12)	“...located in the Wroclavia shopping center...” (P2) “There should be proper restrooms, seats, and basic amenities like tea/coffee/newspaper kiosks.” (P5) “Good place, but the toilet should be free.” (P13) “Ticket sales lady is rude and doesn’t speak English.” P17
Theme 6: Impact to Urban Identity	“It’s also so neglected there, there’s a huge thicket full of garbage, clothing, beer bottles, and other things. If something isn’t done soon, the situation will only get worse, with nothing but useless projects and ideas that don’t help the station at all...” (P6)	“...It was a transfer station on the way.” (P1) “Beautiful, useful. Not like the one in Warsaw...” (P16)

The themes obtained from the analyses conducted in this study are presented collectively in Figure 6 below, in addition to Table 8.

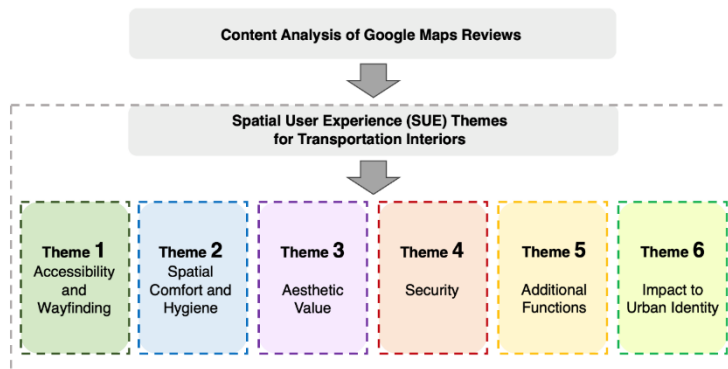


Figure 6. Graphical summary of findings of the study

“Accessibility and wayfinding” emerged as one of the most frequently mentioned themes. While some users praised the ease of transfers and well-marked routes at both Berlin Südkreuz and Wrocław Central stations, others reported serious issues such as malfunctioning elevators and escalators. “Spatial Comfort and hygiene” emerged as a critical concern. In the Berlin example, positive reviews highlighted the layout, while many users reported unpleasant conditions such as poor hygiene and lack of seating. The Wrocław example, on the other hand, was found to be clean and tidy by almost all users, receiving a more positive assessment than the Berlin example. Regarding “Aesthetic Value”, both examples were positively evaluated. For both stations, users perceived the modern design and visual appeal. “Security” emerged as a persistently complained-about issue, particularly at Berlin Südkreuz. Numerous users reported discomfort due to a lack of security personnel and the presence of intoxicated individuals. “Additional Functions”, such as shopping and dining areas, were positively received at both stations. However, while the Wrocław example was positively viewed for its connection to a large mall, the Berlin example received positive feedback for having more additional functions directly within the station itself. “Impact on Urban Identity” was evident in perceptions of neglect and maintenance. Users criticized the Berlin example, describing the environment as dirty and poorly managed. In the Wrocław example, one user compared it to Warsaw, the capital of Poland, highlighting the better Wrocław terminal. These opinions demonstrate that transportation hubs play a symbolic role in shaping a city’s image, both positively and negatively.

CONCLUSION

This study examines the user experience of transportation interiors through a comparative analysis of Berlin Südkreuz Station and Wrocław Central Bus Terminal, identifying common user themes. Adopting a phenomenological approach and analyzing Google Maps comments as user-generated data, the study identified recurring themes among users: Accessibility and wayfinding, Spatial comfort and hygiene, Aesthetic value,

Safety, Additional functions, and Impact on urban identity. These findings highlight that transportation interiors are not merely infrastructural nodes, but more layered cultural and social environments that shape daily practices and perceptions.

The analysis of the sample stations revealed that “accessibility and wayfinding” are among the most influential factors affecting user satisfaction. According to user comments, functional failures such as malfunctioning elevators or inadequate wayfinding significantly reduce perceived accessibility, while consistent wayfinding strategies, multilingual wayfinding, and digital information systems improve spatial readability and independence. Similarly, qualified, and adequate lighting design, sensory atmosphere, and safety measures stand out as critical determinants of user perception, affecting both the psychological well-being and safety of passengers. “Spatial comfort and hygiene” are equally important. Cleanliness, spatial arrangement, ergonomic design, and overall environmental quality directly influence the perception of transportation-functional spaces. In terms of aesthetics, contemporary design approaches in these spaces strengthen the identity and character of transportation hubs, contributing to users’ sense of place. The frequently recurring security issues in the Berlin example highlight the importance of the psychological dimension of user experience, demonstrating the necessity of considering security perception in spatial user experience. Users (P6, P9, P10, P11, P20) reported harassment, lack of visible security staff, and the presence of drunk individuals. Additional functions, such as retail and dining services, enriches the stations’ role as social and cultural spaces beyond their transit function. Another substantial outcome concerns the role of transportation hubs in contributing to urban identity. Berlin Südkreuz station was frequently described by users as unsafe and dirty. A large, overgrown area of bushes in its vicinity, which has become a massive landfill, was criticized. This image has the potential to influence the perception of Berlin for first-time visitors. Wrocław Central Station, on the other hand, was generally rated as better in terms of safety and cleanliness compared to Berlin Südkreuz Station. In one review, Wrocław was compared to Warsaw, the capital of Poland. The user (P16) emphasized that the Wrocław bus station was better than Warsaw’s. This demonstrates that station design has a positive impact on the perception of urban identity. In this respect, the function of stations is not limited to facilitating mobility; they also function as symbolic gateways, shaping visitors’ first impressions of the city. Furthermore, the integration of additional functions such as public art, retail, and spontaneous events within transportation-related interiors, as in the case of Berlin, shows that transportation hubs can go beyond their transportation function, improving user experience and becoming integral components of urban identity.

The study results demonstrate that transportation interiors, particularly waiting and circulation areas, play a decisive role in shaping spatial user experience through the interaction of physical and sensory design elements. This finding is consistent with the literature highlighting the multidimensional and multilayered aspects of user experience, encompassing perception, emotion, and social interaction beyond mere functionality (Norman, 2010; Erap et al., 2021: 341). A comparative analysis of the Berlin Südkreuz and Wrocław Central Bus Terminals revealed that accessibility and wayfinding remain key determinants directly influencing user experience. As Lynch (1964: 101) and Passini (1984: 163) point out, environmental cues such as signage, landmarks, and spatial differentiation reduce cognitive load and facilitate spatial wayfinding. In the Wrocław example, color-coded floor directional signs and multilingual information boards increased readability, while in Berlin, the use of color coding as a tool in directional units and color-coded parametric shapes on the ceiling created recognizable directional signs. These results, based on both user feedback and on-site observations, support Wei et al. (2025: 22), who emphasize the importance of consistent visual systems for wayfinding in complex public transport environments.

The study also found that “hygiene”, “safety”, and “additional functions” shaped user perceptions and reactions. Negative perceptions associated with inadequate care or antisocial behavior corroborate Evans’ (2009: 372) assertion that passengers’ sense of safety is closely linked to the physical and social order of spaces. Conversely, the integration of commercial functions, social amenities, and even spontaneous cultural events demonstrates how transportation hubs can transform into hybrid cultural environments, aligning with Carter et al.’s (2007: 756) view that place identity emerges from multi-layered social practices. It is noted that, beyond providing user comfort and basic spatial functions, transportation spaces contribute to the construction of urban identity. As Tunç (2007: 104) observed in the Istanbul metro, positive user experiences within transportation interiors positively influence the overall perception of the city. Similarly, in this study,

additional facilities or adverse environmental conditions at Berlin Südkreuz Station and the integration of the Wrocław Bus Terminal into a commercial complex have shaped the urban image by serving as symbolic gateways for both local and international users. In conclusion, this study confirms that designing transportation hubs not only as infrastructural nodes but also as experience-oriented spaces where physical accessibility, sensory quality, and social interaction intersect can improve spatial user experience.

This study is expected to contribute to filling a gap in the literature where studies on transportation interiors are relatively limited. The study's findings aim to provide a framework for future design strategies by emphasizing the necessity of user-centered, inclusive, and holistic approaches. Investments in accessibility, clarity of wayfinding, lighting comfort, safety, and additional functions are not merely technical requirements but critical factors shaping user satisfaction, perception of safety, and the urban identity of cities. The study points to the necessity of adopting user-centered and holistic design approaches in transportation interiors. By focusing on user experience in future transportation hubs, psychological well-being can be improved.

Author's Contribution

The author contributed 100% to the study.

Competing Interests

There is no potential conflict of interest.

Ethics Committee Declaration

This study is based solely on open-source data obtained from Google Maps reviews. No personal information was collected, stored, or disclosed, and all analyses were conducted in compliance with ethical research standards.

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Figure References

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Author's Biography

Özlem Kurt Çavuş is graduated from Anadolu University, Department of Interior Design as honor student. Studied at Universidad Europea (Madrid-Spain) with the Erasmus exchange program during the bachelor education. Started working as a research assistant at Anadolu University, Department of Interior Design. Completed her master's degree in 2016 and completed Proficiency in Art program in 2021. In 2022, worked as a researcher in an EU-HORIZON2020 project at Warsaw University of Technology (Poland). Currently working as an Assistant Professor Dr. at Eskisehir Technical University, Department of Interior Design, serving as vice head of department and Erasmus coordinator. She conducts studies on spatial psychology, spatial user experience and design education.