Semarak Proceedings of Applied Sciences and Engineering Technology

Journal homepage:
https://semarakilmu.my/index.php/spaset/index
ISSN: 3083-9807

Experiential Qualities of Contextual Integration for KL Sentral and Penang Sentral Waterfront Transit-Oriented Development (WTOD) in Terms of Legibility Principle

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ABSTRACT

Since transit-oriented development (TOD) was introduced in the 1990s, most developed cities have shifted their focus toward urban regeneration, aiming to create walkable and sustainable environments that encourage public transportation usage. The redevelopment typically involved brownfield areas such as former docklands, waterfronts, or industrial sites, which were transformed into mixed-use developments integrated with public transit. This approach has led to the emergence of waterfront transit-oriented development (WTOD). In Malaysia, only two established WTODs: KL Sentral and Penang Sentral WTOD. In achieving successful implementation, it is crucial for WTOD to be contextually integrated with its surroundings, which, in this case, is the waterfront. The notion of integrating urban development with its local context has been emphasised by most prominent urban design thinkers, with legibility being one of the key principles highlighted. Legibility enhances the experiential qualities while navigating the city and provides people with a clear understanding of how the spaces are connected. Nine (9) attributes concerning legibility were identified, including street condition, pedestrian walkway along the waterfront/ street, transit access to taxi/ bus stop, ground-level porosity, integration of parking with development, signage toward the water body, waterfront link to the TOD, direct access to water body and visual access to water body. Therefore, this research aimed to examine the legibility principle that contributes to the experiential qualities of KL Sentral and Penang Sentral WTOD in terms of their level of contextual integration with the waterfront. A mixed method approach was employed, involving physical observations and questionnaire surveys with 597 respondents across 38 zones in KL Sentral WTOD and 490 respondents across 26 zones in Penang Sentral WTOD. Content and descriptive analyses were used to evaluate the experiential qualities of contextual integration for both WTODs. The findings implied that users' experience regarding the level of contextual integration for legibility in each WTOD varied, highlighting the importance of aligning WTOD with its surroundings.

Keywords: *Experiential qualities; contextual integration; legibility; waterfront transit-oriented development; waterfront*

1. Introduction

Transit-oriented development (TOD) was popularised after Peter Calthorpe introduced it in the late 1990s [1,2]. Since then, many developed cities have adopted TOD as their key driver in urban regeneration, which takes place in brownfield areas such as former docklands, waterfronts, or industrial sites to support urban growth [3]. The redevelopment mainly focused on developing sustainable and liveable urban spaces that encourage the use of public transport and promote

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https://doi.org/10.37934/spaset.1.1.3560a

walkability within a 400m to 800m radius (5-10 minutes' walk), reducing the image of car-centric cities that have been imprinted after World War II (early 20th century) [4,5]. In doing so, waterfronts were redeveloped by integrating mixed-use development with public transit. This approach eventually led to the emergence of waterfront transit-oriented development (WTOD), referring to the TOD located on the waterfront [6].

In efforts to integrate TOD with waterfronts, many cities have emphasised urban design as the critical aspect of distinguishing successful WTODs worldwide [6,7]. Studies have shown that urban design is closely associated with contextual integration by integrating the development's physical and functional elements with its surroundings [8,9], particularly in the case of waterfronts. A contextually integrated WTOD can encourage people to engage with the waterfronts and create a more accessible and vibrant environment that enhances their overall experiences [10,11].

This research focuses on evaluating the legibility principle regarding the level of contextual integration based on the experiential qualities perceived by the users within the WTOD.

1.1 Literature Review

In searching for a relevant approach to evaluate the legibility concerning the experiential qualities of contextual integration for WTOD, it is crucial for this research to strongly contemplate the integrative approach inherent in urban design. Integrative theories of urban design proposed by Sternberg *et al.,* [12] and Bahrainy *et al.,* [13] were found to be related to the context of this research.

Sternberg's integrative theory laid the foundation for integrating urban design principles in discussing the relationship between the development and its surrounding context. Bahrainy and Bakhtiar expanded on Sternberg's theory by emphasising the importance of procedural elements in integrating these principles. They highlighted the role of processes and methodologies, particularly through incorporating stakeholder participation, including policymakers, designers, and the public, which Sternberg did not address in detail but is evidently vital to what this research aims to explore. Nevertheless, it is important to acknowledge that Sternberg was the first to denote legibility as one of the critical principles contributing to the physical dimensions.

Kevin Lynch introduced the legibility principle through his book 'The Image of the City', highlighting the importance of experiential qualities while navigating the city [14]. Lynch opined that the city should be designed in a way that enables people to form mental images of the environment, providing them with a clear understanding of how spaces are connected and helping them orient themselves as they move through the city. It is important for the spaces to be highly accessible and well-connected from the city's end to end to enhance walkability and create liveable street life. He outlined five key elements to make the city more legible: paths, edges, nodes, landmarks, and districts. Paths in the city are defined by the routes people take to move from their origins to desired destinations. Edges represent the boundaries that define areas such as rivers, highways, and train tracks, which added clarity to the city's structure. Next, nodes are the focal points where activities are concentrated or intersections of paths that act as identifiable points that help people be aware of their surroundings. Meanwhile, landmarks serve as a point of reference that stands out in the urban space, featuring towers, iconic buildings, statues, monuments, or landscape features. People commonly use them as reference points when navigating in the city. Last but not least, the fifth element, districts, refers to large areas of the city with distinctive characteristics that are easily recognisable and distinguishable, helping people understand where they are.

The integrative theory advocated by Sternberg *et al.,* [12] aligns with Lynch's ideas that promote the integration of development with its contextual surroundings. His work has paved the way for designing a legible city, shaping the current urban development. This is evident in emerging

guidelines that enhance accessibility and connectivity, especially in WTOD implementation [15,16]. Despite the growing interest in the integration of TOD and waterfronts, to date, the term 'WTOD' is still scarce, as its usage is limited to a few developed cities in the U.S. and Canada [17,18]. Most urban design guidelines concerning TOD with waterfront presence had separately addressed their TOD and waterfront aspects [6]. Thus, with reference to this principle and the literature related to WTOD, waterfront development, and TOD, nine attributes were identified as crucial in evaluating the experiential qualities of contextual integration for WTOD regarding legibility. The attributes include (i) street condition, (ii) pedestrian walkways along the waterfront/ streets, (iii) ground-level porosity, (iv) transit access (to the bus stop), (v) integration of parking with development, (vi) signage toward the water body, (vii) waterfront link to the TOD, (viii) direct access to water, and (ix) visual access to water.

1.1.1 Street condition

Many studies stressed the importance of street conditions in ensuring accessible WTOD, especially for pedestrians [19,20]. The design of the streets should integrate the walking, cycling, automobile, and bus routes to ensure comfort among pedestrians and cyclists. Types of street conditions that are commonly discussed include pedestrian-only, pedestrian-mixed, and car-only streets. Studies indicated that pedestrian-only and pedestrian-mixed streets are prone to enhancing liveability and sustainability more efficiently than car-only streets, specifically in high-density areas [21]. Nevertheless, the condition is deemed optimal when pedestrians can walk along the streets without sharing them with other transportation modes, developing a sense of freedom and safety while exploring the city [22]. This way, people are more encouraged to connect with the waterfront, promoting a better experience of the WTOD environment [23,24]. Conversely, car-only streets will only limit pedestrians' movements, reducing accessibility to all parts of the WTOD. Such conditions could prevent people from using public transport, which contradicts the WTOD concept. Therefore, under any circumstances, a car-centric street must be minimised.

However, it was also revealed that street conditions appropriate to the city vary depending on the local context [20]. In Seoul, Korea, pedestrian-mixed streets correlated more with high pedestrian flow than other types. Although this opposed the findings of previous studies, it suggests that the specific physical characteristics of WTOD and its user behaviours could influence street design. Thus, the approaches should be tailored to the contextual surroundings of the WTOD. The findings will disclose whether this situation applied to the context of KL Sentral and Penang Sentral WTOD.

1.1.2 Pedestrian walkway along the waterfront/ street

Providing convenient, safe, and well-connected walkways throughout the city is another important attribute greatly emphasised across the established waterfront and TOD guidelines related to accessibility [25,26]. The pedestrian walkways should be developed along both sides of 90% of the street, continuously connecting the transit station, waterfront, and other parts of the WTOD. This condition eases users' navigation between different areas, which helps to boost active transit, such as walking and cycling and reduces dependency on private vehicles. The presence of walkways also allows social interactions on the street, making the area more attractive and dynamic [27,28].

Any interruptions or obstacles that break the continuity of the walkway can disrupt the pedestrian flow, which is the major determinant of active street life. From a physical dimension's perspective, such disruptions are driven by the presence of physical barriers such as fencing or walls, which must be minimised as they block pedestrian access [24,29]. By considering these design

factors, cities can create walkways that facilitate high pedestrian movement and enhance the WTOD experience.

1.1.3 Ground-level porosity

Active street environments can also be created by integrating the ground floor level of the built form as part of the public realm [30]. The ground level should be porous and permeable enough for convenient and easy pedestrian access through an urban area [11]. Many studies have associated the porosity/ permeability of movement with the multiple entry points or route choices between any two points influenced by the city's block sizes. A high degree of ground-level porosity is related to which a fine-grained urban fabric enables optimum pedestrian accessibility [31,32].

According to Siksna and Arnis [32], the optimal walking distance for pedestrians is between 60 and 70 meters, while a convenient distance is 100 meters. Conversely, 200 meters would be inconvenient for pedestrians to walk, thus indicating the maximum distance pedestrians could comfortably walk (Figure 1). When multiple route choices are available, pedestrians are more likely to willingly walk to their destinations, granting them the freedom to experience and interact with their surroundings.

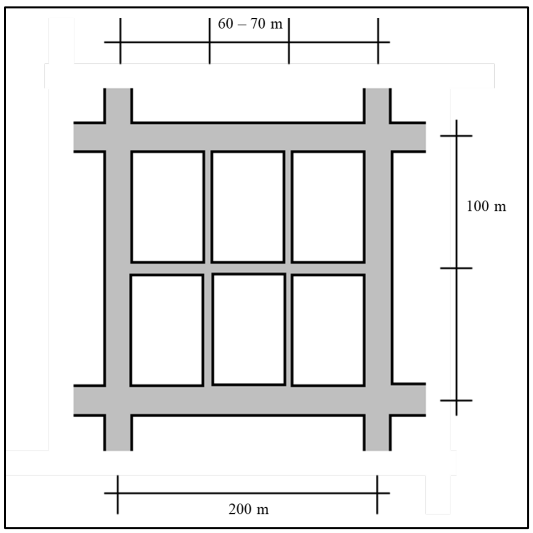

Fig. 1. Desirable pedestrian walking distance [32]

1.1.4 Transit access (to the bus stop)

While the availability of transit stations is significant in WTOD, the presence of bus stops is also emphasised as one of the most important features affecting walkability [33,34]. This is because buses form a much denser network and have shorter stop radius (between 100m to 400m), implying greater reachability than trains that enhance accessibility within the urban area [35]. It must meet the pedestrian's needs within the area and respond to its context. Transit stops, particularly for buses, are only accessible when linked to the pedestrian route. When evaluating the transit access for bus stops, the condition of walkways is assessed up to the nearest street intersection. Studies highlighted that crossing the street and accessing transit vehicles travelling in both directions is a critical element of a functionally accessible pedestrian environment. Incomplete sidewalks, absence of street crossings, obstacles in the pathways such as trees, bollards, utility poles, street furniture and street

vendors are some of the obstructions that create barriers, which limit and hinder access to transit stops [36,37].

It is important to note that this attribute focuses solely on bus transit stops due to their shorter stop radius compared to transit stations. The discussion of other attributes will naturally lead to considerations of accessibility to transit stations.

1.1.5 Integration of parking with development

Among all crucial attributes contributing to legibility in the WTOD context, parking remains a point of contention across studies [38,39]. Despite the conflict, the best practice would be designated parking for all modes of transport as it encourages transit use, particularly for longer commutes [40]. However, when not placed well, parking lots and structures can create dead spaces and disconnect people from interacting with their surroundings [7]. Therefore, it is imperative to integrate parking in a way that complements urban design. To achieve this, car parking should be designed so it can be shared by various uses, such as residential, commercial, and transit. Consequently, shared parking helps to reduce the spaces allocated for cars when not in use [41]. While many TODs and waterfront developments still use conventional parking, such as on-street parking, although it contributes to the active street frontages and makes streets safer for pedestrians by slowing down the traffic, this type of parking could cause traffic congestion and decline the transit ridership [30,42].

In Malaysia, traffic is dominated by motorcycles, which is a common situation in Asian countries [43,44]. Motorcycles offer excellent accessibility due to their ability to provide door-to-door mobility, making it vital to incorporate parking for them that is near the building's entrance rather than away from it. This way, people will feel more comfortable and secure due to the natural surveillance from nearby activities [45,46]. Meanwhile, it is also important to acknowledge those who cycle to their destinations. Although cycling is gaining attention as a travel mode, it is still infrequent in Malaysian culture compared to other European cities. In Malaysia, cycling is more often associated with recreational use than daily transport. Consequently, bicycle infrastructure, especially parking, remains underdeveloped. As a result, it is common in Malaysia for bicycles to be parked alongside motorcycles in shared spaces, especially when designated bicycle parking is unavailable.

Despite the government initiatives to promote cycling in urban areas, many of these efforts do not fit well for daily commuters. One of the driving factors is the tropical climate, which is hot and humid and prone to heavy rainfall that could cause inconvenience for many. While it remains crucial to allocate bicycle parking, in this case, the cycling culture in Malaysia has not made headway, mainly serving recreational purposes that mostly occur during the weekends [47]. Given the context of KL Sentral and Penang Sentral WTODs, where bicycle parking is absent, and cycling is not widely adopted as part of daily commute, contextual integration of WTOD might still be achieved when motorcycle and bicycle parking is assumed as shared. This condition still offers some flexibility for cyclists who need to park and could act as an interim solution that slightly improves integration, although it does not equate to fully dedicated bicycle parking.

Conversely, the absence of designated parking within the WTOD negatively affects the adjacent areas by resulting in parking spillover that causes congestion and inconvenience for other users [38], suggesting that parking is still one of the most important attributes in developing WTOD regardless of the conflict it inflicts.

1.1.6 Signage toward the water body

When visitors navigate a waterfront area, wayfinding is one of the most critical elements affecting their spatial experience. Many have stressed this aspect in determining the legibility of the urban environment [14,48]. Wayfinding refers to the tools and devices that are aimed at helping people navigate efficiently and orient themselves in public places. Most importantly, the spatial experience for wayfinding differs between walking and driving, where the need for clarity is notably more vital for pedestrians than drivers or transit users, as they are more sensitive to distance and more vulnerable to getting confused and lost while searching their way within the city [48,49].

Among the dominant tools in wayfinding, signage played a crucial role. Well-positioned and clear signage should be catered to all transport modes, but extra attention should be given to pedestrians as they will likely depend on the directions when navigating the WTOD. At intersections where paths diverge or change direction, signage becomes significant as these are the critical decision-making points for navigation [14]. To develop a coherent WTOD, signage directing toward the water body must be placed at these intersections, especially where the route turns from one street to another, allowing pedestrians to find their way easily [50].

1.1.7 Waterfront link to the TOD

Before urban regeneration efforts, the waterfront had been treated as the city's backyard, deterring people from engaging with it. However, the waterfront later played a crucial role in various revitalisation projects after it was proven to add value to the community by allowing a continuous flow of activities between the urban fabric and the waterfront, promoting a healthy and vibrant environment [51,52].

In achieving a functional and experiential integration, ensuring 24-hour access to the waterfront should be the primary concern in linking the TOD to its waterfront [30]. While most studies emphasised pedestrian access as a significant determinant for waterfront linking to the TOD [53,54], there is a lack of conclusive evidence discussing the specific indicator that defines a strong link between the two. This attribute is often associated with the characteristics of accessibility rather than the appropriate distance required for pedestrians to experience seamless connections with the waterfront [10]. Thus, similar indicators used by Siksna and Arnis [32] in determining the walking distance for pedestrian access are deemed appropriate to the context of WTOD, which focuses on walkability. As mentioned in the ground-level porosity attribute, a convenient distance for pedestrians to walk is 100 meters. Thus, the research will consider the 100-metre radius in evaluating the waterfront link to the TOD.

1.1.8 Direct access to water

Another attribute frequently highlighted in waterfront development is direct access to the water edge [55,56]. This attribute is strongly related to users' ability to have direct contact with water, implicating the importance of people's accessibility as the central feature of development. There are various types of access that permit direct accessibility, such as staircases or ramps, docks, piers, ferry terminals, water taxi stops, marinas, beaches and shoreline parks [57,58]. These elements provide diverse ways for people to experience the water, allowing a more dynamic engagement with the waterfront environment, whether for transport or recreation. Similar to the previous attribute, most studies on waterfront development have only discussed direct accessibility to water in terms of its accessibility features, with no specific indicators included.

Thus, research concerning street accessibility was referred to in search of a better understanding. In the context of WTOD, to enhance pedestrian accessibility to the water, it is suggested that shorter intervals along the waterfront are essential to provide more frequent access points for people to engage with the water. As discussed in the previous attributes, studies by Siksna and Arnis [32] on desirable pedestrian walking distance seem appropriate to be adopted to indicate effective direct access to the water. However, for this attribute, the evaluation will acknowledge the maximum pedestrian walking distance of 200 meters.

1.1.8 Visual access to water

Apart from direct accessibility, a view of the water is also crucial in enhancing the legibility of waterfront areas. Studies indicated that this attribute is interrelated with direct access, implying any changes occurring to one of these two attributes will subsequently affect the other. A direct view of the water from the window or terrace adds to the attractiveness and increases the property's value of waterfront buildings [59]. This visual connection allows people to experience and appreciate the presence of water, which indirectly supports wayfinding along the waterfront. Hence, a design that grants a transparent view along the water edge is a must to maintain a clear sightline toward the water body. Any physical barriers such as walls, private properties, or highways obstructing the clear visibility of water can disrupt the linkage between the TOD and its waterfront [56,60].

2. Methodology

2.1 Data collection

This research employed a mixed methods approach involving data collection from a questionnaire survey and field observation (visual survey) of the current condition in KL Sentral and Penang Sentral WTOD to evaluate the experiential qualities of contextual integration for WTOD in both areas regarding legibility.

The relationship between the built environment and its users is multi-dimensional, and it includes various aspects of human interaction, behaviour, and perception to ensure a liveable and sustainable living environment. Quantitative and qualitative methods complement each other by offering different perspectives on the same phenomenon. The amalgamation of these methods is purported to be a more potent tool as any weaknesses and biases in one method are neutralised by the strength of the other [61,62].

2.1.1 Demarcation of zones in KL Sentral and Penang Sentral WTOD

To facilitate a comprehensive evaluation, the KL Sentral and Penang Sentral WTOD areas are divided into grids within the 800m TOD radius boundary, resulting in 69 zones for each WTOD. Each grid is within a 100m radius, which is the optimum distance for pedestrians to walk from one point to another [32]. However, 31 zones in KL Sentral WTOD were excluded from the evaluation as the highway and elevated expressway made the area inaccessible and unsafe for walking. For Penang Sentral WTOD, 43 zones were omitted, many of which were comprised of sea and ports that prevented public access. Thus, only 38 zones in KL Sentral WTOD (Figure 2) and 26 zones in Penang Sentral WTOD (Figure 3) were involved in this research.

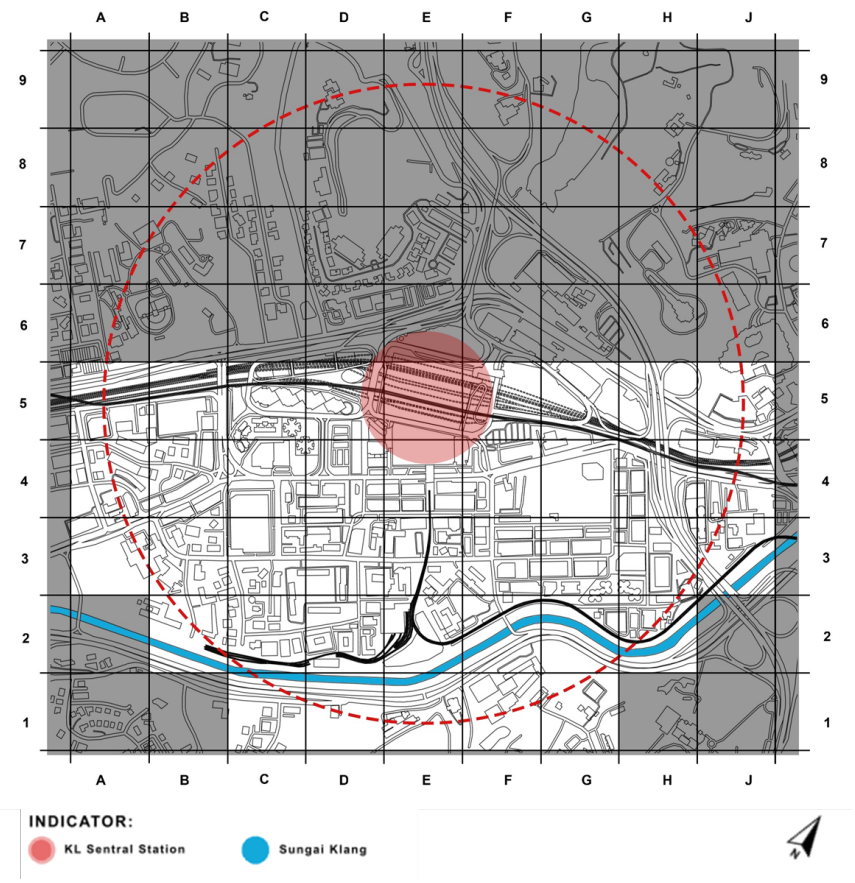

Fig. 2. Map indicating division zones in KL Sentral WTOD

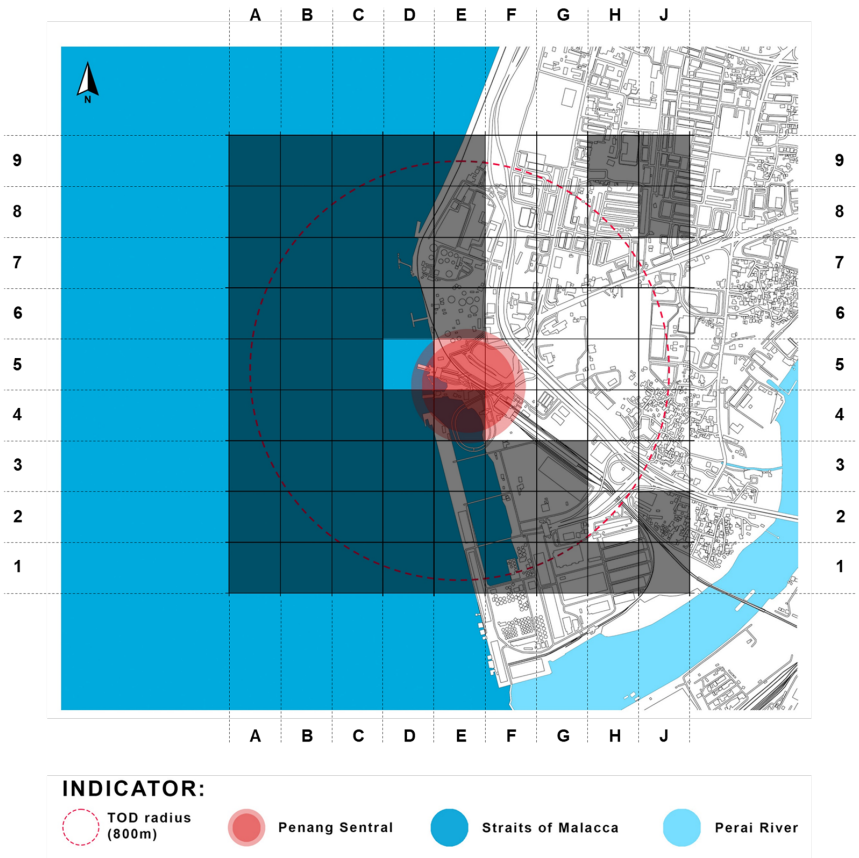

Fig. 3. Map indicating division zones in Penang Sentral WTOD

2.1.2 Questionnaire survey

A questionnaire survey is widely known for its significant role in urban studies as it provides valuable insights from people regarding their perceptions, preferences, and behaviours within the built environment [13,63]. For this research, the survey was used to gain insight into users' experiential qualities of contextual integration in KL Sentral and Penang Sentral WTOD in relation to legibility. The questionnaire consisted of two main sections. Section A consists of the respondents' background information concerning their gender, age, ethnicity, and types of users. Section B provides all the items related to experiential qualities, involving 20 questions derived from the literature review.

Likert scale was used to measure the experiential qualities of WTOD as it is widely known to measure human attitude. Most studies used a 4 to 7-point scale [64], though some have extended this to a 10 or 11-point scale. However, there has yet to be a consensus on the number of scale points to be applied [65]. This research employed a 4-point Likert scale as it was suggested that this format allows the respondents to answer the questions objectively and avoid biases towards more neutral answers [66].

The sampling design employed in selecting respondents was probability sampling, specifically simple random sampling. This design allows every element in the population a chance of being chosen as a subject [67,68]. To facilitate the data collection, both WTODs were divided into grids representing zones within the 800-metre radius. Therefore, single-stage cluster sampling was used as it involves the division of the population into clusters, which consist of geographic areas such as particular boundaries within a locality [68]. In this case, the division of zones represents the clusters, and respondents were selected within each zone using simple random sampling. There were 597 and 490 respondents for KL Sentral and Penang Sentral WTOD, respectively.

2.1.3 Field observations – visual survey

Visual survey is a method that is commonly used in urban design research, frequently employed to examine the current physical conditions of a place [10,69]. This research conducted a visual survey to evaluate attributes related to the legibility principle. The visual survey in this research utilised photographs of physical conditions on-site and AutoCAD measurements. Evaluations of the level of contextual integration were carried out using low, medium, and high indicators based on the works of Abdul Latip and Nurul Syala [10]. Two field assistants were assigned to conduct a visual survey to reduce judgment errors [70]. The observation checklist and reference notes were provided and utilised during the survey. Maps specific to each zone were also provided to locate positions, measurements, and on-site photos. Photographic evidence of the physical condition in each zone is crucial, as it serves as the primary reference for analysing the data. Data obtained from the visual survey was used to support the findings from the questionnaire survey.

2.2 Data Analysis

Qualitative and quantitative data were analysed separately and then brought together to allow cross-validating. This is crucial in evaluating the experiential qualities of contextual integration for KL Sentral and Penang Sentral WTOD regarding the legibility principle. Two types of analysis are appropriate for this research:

i. Statistical analysis involving descriptive analysis using Statistical Package for Social Sciences (SPSS).
ii. Content analysis on the visual survey.

2.2.1 Statistical analysis

In this research, SPSS was used to provide descriptive analysis based on the data from the survey, measuring the central tendency (mean), dispersion (standard deviation), and frequency distribution. These are vital in providing the respondents' profile and the contextual integration based on the experiential qualities for each attribute. The interpretation of the mean score developed by Nunnally et al*.,* [71] was employed and modified to measure the level of the mean score based on the context of this research (Table 1). Many researchers have used this method to describe the descriptive analysis involving the mean score indication level [72,73].

Table 1
Table of mean score interpretation

Mean scale	Level
4.01 – 5.00	High
3.01 – 4.00	Medium-high
2.01 – 3.00	Medium-low
1.00 – 2.00	Low

This research employed a 4-point Likert scale; thus, the level of the mean score must fit the scale used to indicate the respondents' experiential qualities of contextual integration for KL Sentral WTOD. Besides, the level of experiential qualities of contextual integration needs to align with the indicator of contextual integration level measured based on the observation of the physical condition on-site to facilitate the analysis, as both findings will be later cross-referred. The table of mean score interpretation for this research is shown in Table 2.

Table 2
Mean score interpretation for the level of contextual integration based on the experiential qualities

Mean scale	Level of experiential qualities of contextual integration
3.00 – 4.00	High
2.00 – 2.99	Medium
1.00 – 1.99	Low

2.2.1 Content analysis – visual survey

Measurement details documented on the maps of each zone during the visual survey were inputted into AutoCAD. The measurement data was then tabulated according to integration level indicators (high, medium, and low). The parameters for the analysis were adapted and modified based on the literature studies of each attribute (Table 3). The tabulated measurements were subsequently cross-referenced with the observation checklists and on-site photos. The findings were presented in bar charts, illustrating the percentages of each contextual integration level derived from the measurements.

Table 3
Indicators for the level of contextual integration

a) Street condition	
High	Pedestrian only street
Medium	Pedestrian +/ cycling +/ car mixed street
Low	Car only street
b) Pedestrian walkways along the waterfront/ street	
High	Continuous
Medium	Obstacle
Low	Blocked
c) Ground-level porosity	
High	Three access routes
Medium	Two access routes
Low	One/ No access route
d) Transit access (to the bus stop/)	
High	Direct access to transit facilities (e.g., accessway connected to the pedestrian route, presence of pedestrian crossing)
Medium	Obstacles in the pathways (e.g., trees, bollards, utility poles, street furniture, street vendors)
Low	Incomplete walkways (e.g., not connected to pedestrian walkways, no pedestrian crossing)
e) Integration of parking with development (car)	
High	Shared parking
Medium	On-street parking
Low	No parking
Integration of parking development (motorcycle-bicycle)	
High	Near the main entrance of the building
Medium	Away from the main entrance
Low	No parking
f) Signage toward the water body	
High	Positioned at all street intersections
Medium	Positioned at a few street intersections
Low	No signage
g) Waterfront link to the TOD	
High	3 or more access points
Medium	2 access points
Low	1 or no access points
h) Direct access to water	
High	Three entrance points
Medium	Two entrance points
Low	One/ No entrance point
i) Visual access to water	
High	Direct (e.g., can see waterbody, no railing/ iron railing)
Medium	Obstacle (e.g., concrete railing, high hedges, high planter box)
Low	Blocked (e.g., wall, private property, gated area)

3. Results

3.1 Findings and Discussion

3.1.1 Respondents' background

This section provides the overall data regarding the demographic profiles of the respondents based on the descriptive statistics. The background profiles include gender, age, ethnicity, and types of users.

3.1.1.1 KL Sentral WTOD

In KL Sentral WTOD, out of 597 respondents, 60.8% were male (363), and 39.2% were female (234). The findings also indicate that most of the respondents came from the age group of 30-59, with a percentage of 70.0% (418), followed by the 15-29 age group at 19.9% (119) and the 60 and above group at 10.1% (60). This age distribution highlighted KL Sentral WTOD's main role as a work-centred urban hub, drawing a predominantly economically active population.

Concerning ethnic background, the majority of the respondents were Malay, with a percentage of 47.9% (286), followed by Indians, who took 33.2% of the total respondents (198), 'others,' who conveyed a percentage of 11.6% (69), and Chinese, who only imparted 7.4% of the total respondents (44). This ethnic diversity reflected the broader multicultural setting of Kuala Lumpur particularly in Brickfield area where KL Sentral WTOD is located.

Meanwhile, the findings showed that employees represented the most significant segment at 64.7% (386), suggesting that KL Sentral WTOD primarily serves the working population. Residents comprised 21.6% (129), while visitors and passers-by made up 11.1% (66) and 2.7% (16), respectively, indicating limited engagement for short-term users compared to those who are work-oriented. These findings signified KL Sentral WTOD's alignment with the WTOD concept, which supports the integration of mixed uses that meet the demands of diverse users.

Table 4
Frequency analysis of respondents' demographic profile in KL Sentral WTOD

Respondent (n = 597)			
Demographic profile	Category	No. of respondents	Percentage (%)
Gender	Male	363	60.8
	Female	234	39.2
	Total	597	100.0
Age	15 – 29	119	19.9
	30 – 59	418	70.0
	60 and above	60	10.1
	Total	597	100.0
Ethnicity	Malay	286	47.9
	Indian	198	33.2
	Chinese	44	7.4
	Others	69	11.6
	Total	597	100.0
User types	Residents	129	21.6
	Employees	386	64.7
	Visitors	66	11.1
	Passer-by	16	2.7
	Total	597	100.0

3.1.1.1 Penang Sentral WTOD

In Penang Sentral WTOD, out of 490 respondents, 53.9% were male (264), and 46.1% were female (226). The findings also indicate that most of the respondents came from the age group of 30-59, with a percentage of 52.7% (258), followed by the age group of 15-29, which carried 36.3% of the total respondents (178) and the age group of 60 and above, which resembled only 11.0% of the respondents (54). The age distribution suggested that Penang Sentral WTOD serves a mainly economically active population, likely due to the area's role as a functional hub for employment, transit, and related activities.

Regarding ethnicity, the majority of the respondents were Malay, with a percentage of 60.4% (296), followed by Indians, who took 18.0% of the total respondents (88), 'others,' who conveyed a percentage of 11.0% (69), and Chinese, who only imparted 10.6% of the total respondents (52). This ethnic composition demonstrated the surrounding neighbourhood's cultural landscape and the diverse character of the population that Penang Sentral WTOD attracts.

For user types, visitors formed the most significant number of respondents, accounting for 34.9% of the total respondents (171). This suggests that Penang Sentral WTOD played a crucial role as a transit destination drawn by its transit facilities and services, particularly the ferry terminal and interstate railway. Following visitors, residents represented 33.1% (162), while employees comprised 25.9% (127), indicating the area's role in supporting residential life and employment opportunities. Passers-by portrayed only 6.1% of the respondents (30), emphasising Penang Sentral WTOD's role as a mixed-use destination.

Table 5
Frequency analysis of respondents' demographic profile in KL Sentral WTOD

Respondent (n = 490)			
Demographic profile	Category	No. of respondents	Percentage (%)
Gender	Male	264	53.9
	Female	226	46.1
	Total	490	100.0
Age	15 – 29	178	36.3
	30 – 59	258	52.7
	60 and above	54	11.0
	Total	490	100.0
Ethnicity	Malay	296	60.4
	Indian	88	18.0
	Chinese	52	10.6
	Others	54	11.0
	Total	490	100.0
User types	Residents	162	33.1
	Employees	127	25.9
	Visitors	171	34.9
	Passer-by	30	6.1
	Total	490	100.0

3.1.2 Legibility principle that contributes to the contextual integration for WTOD based on the users' experiential qualities

The experiential qualities of the contextual integration for both KL Sentral and Penang Sentral WTOD in terms of the principle of legibility indicated means score value of 2.35 (with a standard deviation of 0.5707) and 2.36 (with a standard deviation of 0.3859), respectively (refer to Table 6).

These findings suggested that the experiential qualities of contextual integration for both WTODs were at a medium level.

Table 6
Users' experiential qualities of the contextual integration for KL Sentral and Penang Sentral WTOD based on the principle of legibility

Principle/ Attributes	KL Sentral WTOD		Penang Sentral WTOD	
	Respondent (n = 597)		Respondent (n = 490)	
	Mean	Std. Deviation	Mean	Std. Deviation
Legibility	2.35	.5707	2.36	.3859
Street condition	3.35	.9336	3.02	.6311
Pedestrian walkway along the waterfront/ street	2.74	.9876	2.73	.6354
Ground-level porosity	3.16	.8488	2.52	.6342
Transit access to bus stop	3.77	.5917	3.25	.5837
Integration of parking with development	2.03	1.078	2.42	.5233
Signage toward the water body	1.27	.4974	1.19	.6935
Waterfront link to the TOD	1.72	1.047	2.10	.6935
Direct access to water	1.63	.9645	2.16	.6389
Visual access to water	1.46	.8666	1.84	.7619

The findings align with the level of integration evaluated through the visual survey, as shown in Figure 4 (KL Sentral WTOD) and Figure 5 (Penang Sentral WTOD). The overall level of integration for legibility implied that both WTODs had mixed levels of integration, with the highest percentages demonstrating a low level, followed by high and medium levels.

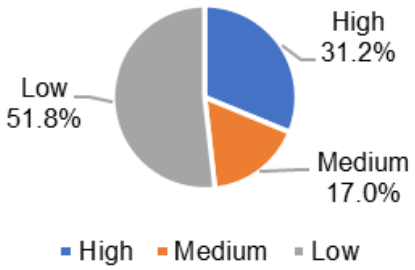

Fig. 4. Percentages of the level of integration for legibility based on the visual survey in KL Sentral WTOD

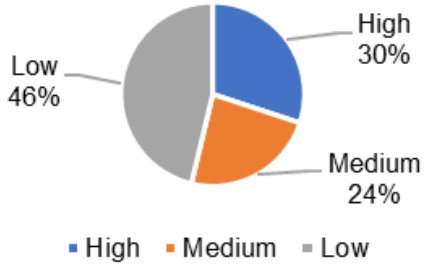

Fig. 5. Map Percentages of the level of integration for legibility based on the visual survey in Penang Sentral WTOD

Based on Table 6, there were three attributes in KL Sentral that demonstrated a high level of integration, including street condition (mean = 3.35, SD = 0.9336), transit access to bus stops (mean = 3.77, SD = 0.5917), and ground-level porosity (mean = 3.16, SD = 0.8488). However, Penang Sentral showed only two attributes with a high level of integration: street condition (mean = 3.02, SD = 0.6311) and transit access to bus stops (mean = 3.25, SD = 0.5837). This implied that KL Sentral WTOD had more attributes with high levels than Penang Sentral WTOD.

Pedestrian walkways along the waterfront/ street (mean = 2.74, SD = 0.9876) and integration of parking with development (mean = 2.03, SD = 1.078) were the only attributes that possessed a medium level of integration in KL Sentral WTOD. In contrast, Penang Sentral WTOD comprised five attributes with a medium level, which include pedestrian walkways along the waterfront/ street (mean = 2.73, SD = 0.6354), ground-level porosity (mean = 2.52, SD = 0.6342), integration of parking with development (mean = 2.42, SD = 0.5233), waterfront link to TOD (mean = 2.10, SD = 0.6935),

and direct access to water (mean = 2.16, SD = 0.6389). The results of both areas indicated that Penang Sentral WTOD had a higher number of attributes with a medium level and better integration than KL Sentral WTOD in terms of the attributes mentioned.

Meanwhile, four attributes in KL Sentral WTOD were perceived as low level, including signage toward the water bodies (mean = 1.27, SD = 0.4974), waterfront link to the TOD (mean = 1.72, SD = 1.047), visual access to water (mean = 1.46, SD = 0.8666), and direct access to water (mean = 1.63, SD = 0.9645). Conversely, Penang Sentral demonstrated low levels for only two attributes: signage toward the water bodies (mean = 1.19) and visual access to water (mean = 1.84, SD = 0.7619). The results suggested that KL Sentral WTOD exhibited slightly better integration in terms of signage toward the water bodies than Penang Sentral WTOD. Penang Sentral WTOD showed better integration in terms of visual access to water.

The research will further discuss the differences in the findings obtained according to each attribute by cross-referencing data from visual surveys and literature studies.

3.1.2.1 Street conditions

Referring to the users' responses regarding the experiential qualities of contextual integration shown in Table VI, the level of integration for street conditions was regarded as high in both WTOD areas. However, slightly better integration was perceived in KL Sentral than Penang Sentral. Conversely, the findings from the visual survey on the street condition exhibited contradicting results where pedestrian-mixed streets and car-only streets were typical in KL Sentral and Penang Sentral, indicating medium and mixed levels of integration (Figure 11).

Most Penang Sentral zones had higher percentages of car-only streets. Nevertheless, Penang Sentral recorded one zone with a high level, which can be seen in zone D5. This is the zone where the ferry terminal and bus station are located. During the fieldwork, it was observed that most people travelled by car, parked, and then walked to the buildings using the nearby walkways. Thus, walkability is only for short distances in Penang Sentral WTOD. This condition aligns with another complementary condition that influences walkability, added by [74]: border vacuum. Border vacuums such as transportation facilities (such as waterfronts, railroads, and larger roads) can act as physical barriers, if not controlled, that reduce walkability and encourage more car usage [22,75]. Although similar conditions were seen in KL Sentral WTOD, large roads were not located in the middle of the WTOD radius and were spotted only near the outer ring of the radius. KL Sentral exhibited better integration based on the overall findings from the visual survey and users' experiential qualities. This implied that users in KL Sentral WTOD perceived the pedestrian-mixed streets as having a high integration level, implicating their satisfaction with such conditions. However, the mixed-street conditions and heavy reliance on cars in Penang Sentral WTOD contributed to the experiential qualities at the medium level. This finding aligns with previous studies that stressed the importance of adapting street conditions to the local context [76].

3.1.2.2 Pedestrian walkways along the waterfront/ street

Based on the users' experiential qualities, the pedestrian walkway along the waterfront/ street received a medium level of integration for both WTODs (Table 6). The visual survey findings indicated that most of the zones in both WTODs exhibited mixed levels of integration (Figure 11). However, despite having mixed levels, few zones with the presence of water bodies and transit stations showed a fully continuous walkway. This condition can be seen in seven zones (A3, B2, E5, F1, F2-left bank, G2-left bank, and J5) in KL Sentral WTOD and two zones (D5 and E5) in Penang Sentral WTOD.

Nevertheless, KL Sentral WTOD had more zones with an entirely high-level integration than Penang Sentral WTOD.

None of the zones in KL Sentral WTOD had an entirely blocked walkway. In contrast, Penang Sentral WTOD showed the presence of a fully blocked walkway in three zones: H2, H5, and H6, indicating a low level of integration. When there are convenient, safe, and well-connected walkways throughout the city, pedestrians will be indirectly encouraged to walk to their destination [34]. These findings supported the results obtained from the users' experiential qualities of contextual integration.

3.1.2.3 Ground-level porosity

Ground-level porosity contributed to a high level of integration in KL Sentral WTOD and a medium level of integration in Penang Sentral WTOD based on the users' experiential qualities of contextual integration in Table 6. However, the findings from the visual survey in both WTODs illustrated different outcomes, where most of the areas in KL Sentral (63%) and Penang Sentral (65%) WTODs had low integration levels with one or no access route, followed by medium level (25% in KL Sentral and 19% in Penang Sentral WTODs) with two access routes, and high level (12% in KL Sentral and 16% in Penang Sentral WTODs) with three or more access routes (Figure 11).

How can this be explained? Studies on pedestrian movement indicate that well-connected pathways within a city can create a perception of continuous movement even with limited access routes. Such experience is amplified when the streets between the buildings and spaces are accessible; users may perceive the area as easy to navigate, making them feel connected to their surroundings [77,78]. This condition is evident, especially for KL Sentral WTOD, where connected walkways along the waterfront/ street cover 80.7% of the area. Although it is slightly below the ideal of 90% coverage area, the findings implied a strong indicator of good integration.

3.1.2.4 Transit access (to the bus stop)

The evaluation of transit access (to the bus stop) in both WTODs only involved zones with transit facilities nearby. A total of 18 zones in KL Sentral WTOD and seven in Penang Sentral WTOD were identified and evaluated accordingly.

Transit access (to the bus stop) acquired a high level of integration for both WTODs, with KL Sentral WTOD possessing slightly better integration than Penang Sentral WTOD (Table 6). Findings from the visual survey showed that more than half of the zones (11 zones: A3, B4, C1, C4, D5, E3, E4, E5, F1, H4, and J4) had entirely direct access to transit facilities in KL Sentral, indicating a high level of integration. The remaining seven zones (A5, C5, D3, F4, F5, H5 and F2) had mixed levels. Penang Sentral WTOD, in contrast, had only one zone (Zone D5) with direct access to transit facilities, as almost all the zones had mixed levels of integration. None of the WTOD areas had a completely low level of integration, indicating transit stops disconnected from the pedestrian walkways or absence of crossings (Figure 11). Accessing transit stops should be achieved by walking, and it is only accessible when designed to be walkable by all users [36,37]. Although the users perceived good satisfaction with the condition of the transit access (to the bus stop), the presence of obstacles in the pathways (e.g. bollards, street furniture, utility poles, street vendors) and incomplete walkways that reflect disconnected walkways or the absence of pedestrian crossings in both areas signified that improvements are still needed.

3.1.2.5 Integration of parking with development

Based on the users' responses regarding the experiential qualities of contextual integration shown in Table VI, the integration of parking with development was deemed at a medium level for both WTODs, with Penang Sentral possessing slightly better integration than KL Sentral.

For the visual survey, two types of parking were evaluated: car and motorcycle-bicycle parking. Findings concerning the experiential qualities were found to be aligned with the visual survey of both WTODs. Based on the overall visual surveys, KL Sentral WTOD demonstrated 73% of the zones with high-level integration. In comparison, Penang Sentral WTOD revealed 74% with high-level integration, suggesting slightly better integration.

Regarding the integration of car parking, the findings indicated the presence of medium and mixed levels of integration in both WTODs, comprising a mix of shared parking and on-street parking in KL Sentral WTOD and on-street parking and parking lots in Penang Sentral WTOD that largely made both areas (Figure 11). However, the physical observation demonstrated that KL Sentral WTOD had a higher proportion of parking integrated through shared spaces (33%), indicating better integration. Penang Sentral WTOD, on the contrary, had very few (12%), which can only be seen in four zones (E5, F5, H4, and J4). Although on-site car parking is available in most zones of both WTODs, large parking lots and a lack of shared parking are more eminent in Penang Sentral WTOD. As discussed in the previous attribute on street conditions, most travelling in Penang Sentral WTOD is done by private vehicles, which affects the overall experience of the WTOD. When people are accustomed to travelling by car, they tend to perceive the availability of parking as a positive feature.

The findings obtained regarding motorcycle-bicycle parking showed that 45% of the zones exhibited parking near the main entrance of buildings, indicating a high level of integration in KL Sentral. In contrast, Penang Sentral had a better result, with 62% of the zones demonstrating parking near the building's main entrance (Figure 11). Despite the outcome, the presence of parking away from the entrance and the absence of dedicated motorcycle-bicycle parking in other zones showed that improvement is still needed. The lack of designated parking could result in poorly parked bicycles or motorcycles obstructing pedestrian movement, further creating hazards for pedestrians [44], as shown in one of the zones in KL Sentral WTOD (Figure 6).

Fig. 6. Motorcycles are parked on the walkway in one of the zones (G3) in KL Sentral WTOD

3.1.2.6 Signage toward the water body

The attribute of signage toward the water body was regarded as having a low level of integration for both WTODs according to users' experiential qualities, with KL Sentral having slightly better

integration than Penang Sentral. Findings based on the visual survey also indicated similar results. Most of the zones showed the absence of signage toward the water bodies, indicating a low level of integration in both WTODs (Figure 11). Only one zone was regarded as high level in KL Sentral (Zone F2) and Penang Sentral (Zone G6) WTOD, indicating signage at all street intersections. A few zones were suggested as medium level, as shown in eight zones in both WTODs with signage at a few street intersections.

The existing signages are only present within the 'Brickfields cultural walk' area, which did not suffice to increase the wayfinding to the river in KL Sentral WTOD. Likewise, signages in Penang Sentral WTOD are only directed toward the ferry terminal. Although it indicates water body presence, the signage only points to the terminal rather than the water itself, which may not be strong enough to make an evident presence of the water body. The condition of signages in both WTODs is reflected in Figure. There should be proper signage in the urban area to help people navigate towards the waterfront, as mentioned by Abdul Latip and Nurul Syala [10].

3.1.2.7 Waterfront link to the TOD

Based on the users' experiential qualities of contextual integration exhibited in Table 6, the level of integration for the waterfront link to the TOD was regarded as low in KL Sentral WTOD and medium in Penang Sentral WTOD. However, the findings based on the visual survey reflected inconsistent outcomes, especially for Penang Sentral WTOD (Figure 11).

Both WTODs demonstrated that most zones had low levels of integration, with only one or no access point to the waterfront. Only two zones in KL Sentral WTOD (Zones F2 and G2) and one zone in Penang Sentral WTOD (Zone E5) were observed with two access points. Additionally, Penang Sentral WTOD had no access linking the city to the waterfront in the remaining zones. Conversely, KL Sentral had 15 zones with one access, reflecting better waterfront access than Penang Sentral. Studies implied that limited accessibility from the city to the waterfront caused people to feel disconnected from the water bodies and eventually drove them away. However, the users in Penang Sentral feel that they can still access the waterfront despite the poor accessibility in the area. Why did the users' experience differ from the visual survey, particularly in Penang Sentral?

In Penang Sentral, the physical condition along the waterfront exhibited that ports, petrol terminals, and smelting facilities had blocked the access points to the water bodies. Given the current condition, most respondents said they travel up north (outside Penang Sentral WTOD area), where the waterfront was easily accessible. The trip took 10-15 minutes by car, and it took a distance of 6 km or more from the Penang Sentral WTOD area.

One of the respondents mentioned another reason for seeking the waterfront outside the WTOD area. She described the waterfront as a 'beach area', indicating that users feel more attracted to the waterfront, especially when it is in its natural condition. This showed that when other parts of the waterfront are available within a short distance and offer more natural conditions, people will put more effort into travelling to find a better waterfront experience. On the contrary, this situation did not occur in KL Sentral, where the river had been straightened and concretised, resulting in a complete absence of the river's natural character. These findings were supported by Ragheb *et al.,* [54] and Othman *et al.,* [79] who highlighted that people still desire access to the waterfront despite the difficulties they might experience.

It appeared that this condition undermined the purpose of WTOD, which aimed to encourage walkability [80,81]. The need for users to travel outside the WTOD radius to seek a better waterfront experience highlights a serious lack of integration between the waterfront and the TOD.

3.1.2.8 Direct access to water

The evaluation of this attribute concerning the visual survey only involved the zones with the presence of water bodies. Eleven zones were identified in KL Sentral WTOD, while only two were allowed for evaluation in Penang Sentral WTOD.

Referring to the users' experiential qualities of contextual integration demonstrated in Table 6, the contextual integration level for direct access to the water was regarded as low in KL Sentral WTOD and medium in Penang Sentral WTOD. However, the visual survey exhibited findings that differed from the contextual integration perceived by the users, particularly for Penang Sentral WTOD. Both WTODs resulted in a low level of integration, indicating one or no entrance points to the water (Figure 11). Only two out of 11 zones evaluated (Zones E1 and F2) were observed with one entrance point in KL Sentral WTOD (Figure 7). The existing entrance points to the water were designed and used for access to river maintenance. Penang Sentral WTOD, on the other hand, had one entrance point observed in two evaluated zones (Zones D5 and E5), as shown in Figure 8. The zones were limited to the area with Penang Sentral buildings and ferry terminals, as this was the only part of the waterfront accessible to the public.

Fig. 7. The entrance points to the water in zones E1 (left) and F2 (right) in KL Sentral WTOD

Zone E5

Zone D5

Fig. 8. The Direct access to the water in zones E5 and D5 in Penang Sentral WTOD

How did the users' experience differ from the findings on the visual survey, particularly in Penang Sentral? According to studies by Waterfront Advisory Committee [17] and Omar *et al.,* [82] direct access to water is highly associated with how the city is linked with its waterfront. Given this fact, contextual integration attributed to the previously discussed waterfront link to the TOD was deemed low for KL Sentral WTOD but medium for Penang Sentral WTOD. However, it was mentioned that users in Penang Sentral WTOD had to drive further away from the area for the waterfront experience. This, unfortunately, contradicts the concept of WTOD in promoting walkability. Thus, it can be confirmed that in Penang Sentral WTOD, direct access is limited to the ferry terminal area. Hence, people did not have full access to water within the WTOD area, but they could access water directly elsewhere, indicating a low integration level.

3.1.2.9 Direct access to water

Based on the users' experiential qualities of contextual integration shown in Table 6, the level of contextual integration was low for both WTODs. Findings based on the visual survey indicated that most KL Sentral WTOD and Penang Sentral WTOD zones had mixed integration levels, where direct and blocked visual access dominated the areas, which conflicted with the integrations perceived by the users (Figure 11).

The condition of visual accessibility in KL Sentral exhibited the presence of railings and pedestrian walkways near the water's edge that allowed direct visual accessibility to the waterfront. However, this access was mainly seen on one side of the riverbank. Additionally, most of the zones near the river have tall buildings (E2, G2, H2, and J3) and buildings built abutting the river (B2, C2, and D2) that block the view of the river from other zones (Figure 9). Conversely, in Penang Sentral, buildings were built abutting the waterfront in all zones along the coastline, blocking the public's water access and limiting their visual access to the area (Figure 10).

Fig. 9. Building condition along the waterfront in KL Sentral WTOD

Fig. 10. Presence of ports (left), petrol terminal, and smelting facilities (right) along the coastline in Penang Sentral WTOD.

The waterfront was only accessible from two zones, where the Penang Sentral building and ferry terminal were located. Studies by Ragheb *et al.,* [54] and Erdem *et al.,* [83] have shown that people have a visual connection to the water when there is clear sight and direct accessibility from the city to the waterfront. The attribute of direct access to the water discussed previously resulted in a low level of integration for both WTODs. This indicated that a serious lack of entrance points to the waterfront in most zones impacted the visual accessibility of the water as it made people lose sight of the water bodies and consequently made them unaware of the presence of water bodies [10].

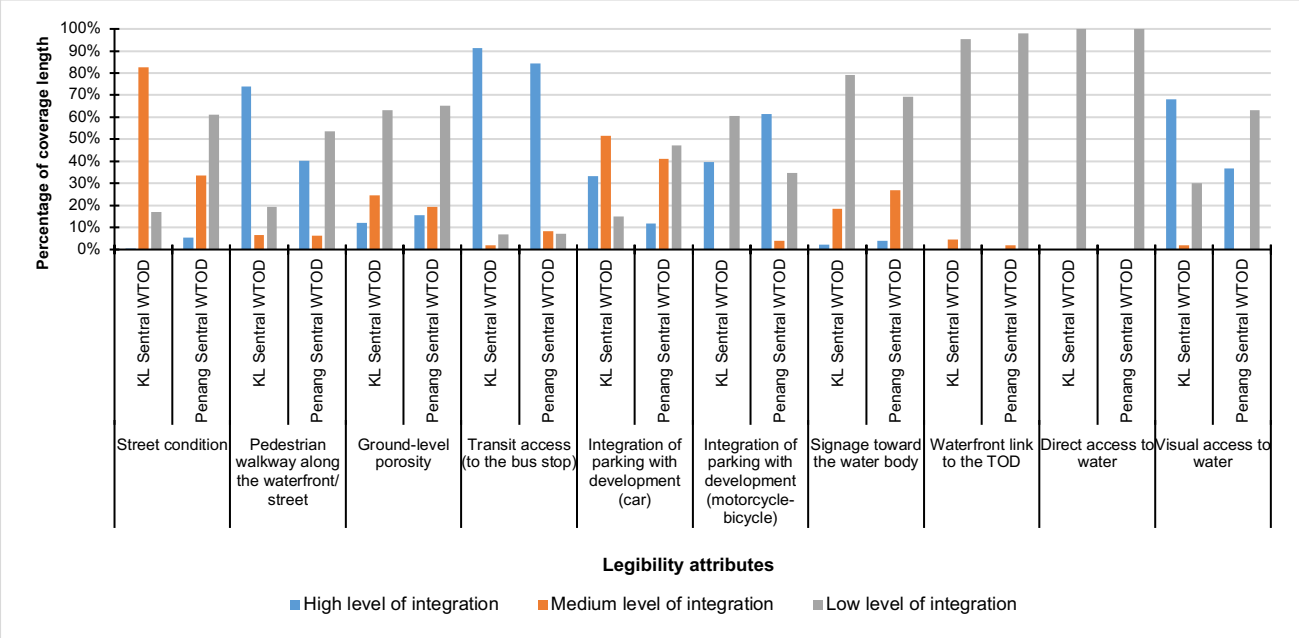

Fig. 11. Level of integration for the attributes related to legibility based on the percentage of coverage area in KL Sentral and Penang Sentral WTODs

4. Conclusions

This research provides critical insights into integrating waterfront transit-oriented development (WTOD) with its contextual surroundings regarding legibility. Therefore, identifying the attributes that contribute to the experiential qualities of contextual integration through their integration levels is crucial in acknowledging the specific attributes that enhance or limit the user experience. By examining KL Sentral and Penang Sentral WTOD, this research stressed how strategic improvements in walkability, waterfront access, and user-centric design can significantly elevate the experiential qualities of contextual integration for these areas.

The analysis comprised nine key attributes that were deemed crucial in legibility principle, which include street conditions, pedestrian walkway along the waterfront/ street, ground-level porosity, transit access (to the bus stop), integration of parking with development (car and motorcycle-bicycle parking), signage toward the water body, waterfront link to the TOD, direct access to water and visual access to water – to examine their contribution on the experiential qualities in terms of their level of contextual integration with the waterfront. Findings indicated that three attributes, including street conditions, ground-level porosity, and transit access (to the bus stop), substantially contributed to the high contextual integration in KL Sentral WTOD. Conversely, in Penang Sentral WTOD, only one attribute was associated with high experiential qualities: transit access (to the bus stop). However, street conditions and ground-level porosity attributes contributed to medium experiential qualities. Meanwhile, both WTODs exhibited similarities with two attributes involving pedestrian walkways

along the waterfront/ street and integration of parking with development, which enhanced the experiential qualities of contextual integration at the medium level. Enhancement of these attributes is critical for users to fully experience the WTOD area as they contribute significantly to overall accessibility.

Despite efforts to connect users with the waterfront, both WTODs showed limited success in this area. Four attributes, including signage toward the water body, waterfront link to the TOD, direct access to water, and visual access to water, contributed to the low experiential qualities of contextual integration. This gap signalled a critical need to prioritise the improvements that strengthen the connection with the waterfront, creating a richer user experience.

The findings also suggested that some experiential qualities perceived by the users conflicted with the physical condition of WTOD, particularly regarding street conditions, waterfront linked to the TOD, and direct access to water in Penang Sentral WTOD. Walkability in the WTOD area appeared limited, as most activity was constrained to short distances, primarily involving movement between parking areas and buildings due to the heavy reliance on private vehicles. Subsequently, users' experiential qualities were impacted by this restricted walkability. This indicated that users' experiences are not only influenced by the physical conditions of WTOD but also by the context of transportation. Thus, it is crucial to address the transportation context together with the attributes in order to enhance the WTOD environments.

The demographic patterns in both WTODs added further insights by demonstrating similarities related to the age group and ethnicities predominant in the area, implicating that WTOD attracted most people within the age group of 30-59. Various ethnicities in both WTODs suggested a diverse user base, highlighting the importance of inclusive urban design that caters to the needs of people of different cultural backgrounds. However, the distribution of user types revealed significant differences. Employees comprised the dominant user group in KL Sentral WTOD, suggesting that the urban design effectively caters to the needs of employees, providing facilities that support daily commuting and work-related activities. On the contrary, visitors were more prevalent in Penang Sentral WTOD, indicating that the area's attraction is more oriented toward transit destination, reflecting its role as a transit hub and emphasising the ferry terminal's critical function in connecting to Penang Island.

In sum, this research advocates for a tailored approach to urban design that considers both physical and experiential qualities perceived by users based on their contextual surroundings. The differing user demographics implied that urban planners and designers should consider the specific demographics and their associated needs when developing WTODs. These findings are crucial as a guide for authorities, developers, and consultants in their involvement in the future development of WTOD in Malaysia, that need to be addressed with a context-specific approach.

Acknowledgement
This research is supported and funded by MOHE – Ministry of Higher Education under FRGS (FRGS/1/2020/WAB09/USIM/02/1).

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