A Walkability Assessment of Al-Mutanabbi Street in Baghdad City: A Case Study

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ABSTRACT

The walkability assessment is crucial to the walking promotion initiatives. The most common methodology for walkability assessment is the Highway Capacity Manual (HCM), but it is limited to the physical characteristics of the walkways, which are not sufficient for assessing the recreational areas. This study aims to evaluate the walkability of a recreational area with unique historical and cultural features using a developed questionnaire. Al-Mutanabbi Street in Baghdad City was selected for this purpose. The Neighborhood Environment Walkability Scale (NEWS)-Recreational questionnaire was developed in this research to combine physical elements and perception factors. The walkway and sidewalk widths, speed, and pedestrian flow were manually collected. The developed questionnaire was distributed to 392 pedestrians to collect their responses. The results show that Al-Mutanabbi Street is rated "Good" with a score of 3.6, according to the developed NEWS-Recreational survey, with moderate ratings for movement, accessibility, and physical characteristics that require improvement. However, the HCM methodology rate is the Level of Service (LoS) "F". The difference in the results may introduce a potential bias because the HCM approach relies solely on quantitative, infrastructure-based criteria. At the same time, the NEWS-Recreational tool employs a mixed-methods approach that combines objective evaluations with perception-based and qualitative feedback. This makes the developed NEWS-Recreational questionnaire more comprehensive than the traditional methods.

Keywords-Highway Capacity Manual (HCM); Likert analysis; NEWS recreational questionnaire; Pedestrian Level of Service (PLoS); walkability rating

I. INTRODUCTION

Many developed countries have significantly advanced the urban walkability by integrating multimodal transportation systems. These systems aim to enhance the pedestrian experience by offering safe, accessible, and aesthetically pleasing walking environments. Walking is universally recognized as the most fundamental, affordable, and sustainable form of transportation. It plays a critical role in the urban mobility due to its contributions to the environmental sustainability, public health, economic vitality, and social equity [1, 2].

According to the World Health Organization (WHO), the physical inactivity is one of the leading risk factors for e global mortality, affecting over 1.4 billion adults worldwide, who do not engage in sufficient physical activity [3]. In response, sustainable transportation strategies that include walking have been promoted as solutions to the rising urban challenges. Walking directly contributes to Sustainable Development Goals (SDGs), particularly SDG 3: Good health and well-being, SDG 9: Industry, innovation and infrastructure, and SDG 11: Sustainable cities and communities [4].

Walkability, defined as the extent to which the built environment supports and encourages walking, is influenced by the physical infrastructure (such as sidewalks and crossings), safety, accessibility, land use, aesthetics, and perceived environmental quality [5]. To determine the Pedestrian Level of Service (PLoS), the pedestrian flow rate and speed were the primary metrics. Following this, additional PLoS investigations with created MOEs were undertaken at various walking facilities [6].

The HCM 2010 considers the infrastructure and road user groups by analyzing the road network LoS [7]. According to the HCM guideline, PLoS can be compared to other transportation facilities. PLoS guidelines for sidewalks and walkways address design environment components, but they do not assess the pedestrian needs. However, the HCM technique's disadvantages were noted in [8, 9]. This strategy

neglects many factors, especially the subjective ones. Additionally, it ignores the cultural context and walking experience. Authors in [10] illustrated the HCM's limitations in rating pedestrian infrastructure using qualitative measures. A questionnaire was utilized as a supplement.

Authors in [11, 12], developed the NEWS, the most widely used subjective measure of walkability in neighborhood environments worldwide. It contains multiple-choice questions developed in the form of a Likert scale, where one is "strongly disagree" and four is "highly agree". Research has customized the NEWS survey to its purposes. Authors in [13] used the Australian NEWS survey to establish the key walking time components. The study discovered that subjective walkability has a considerable impact on the walking time. In Stockholm, Sweden the perceived walkability boosted the leisure walking [14]. Authors in [15] used NEWS to survey Ghent and found similarities with the findings of [12]. The study indicated that the perceived walkability increases the walking frequency and duration. Authors in [16] examined Chicago's walkability with NEWS. It was found that the safety and community participation encourage walking to many events. The NEWS survey contained 83 topics and was comprehensive. Authors in [17] shortened the NEWS. The quick assessment combined building aesthetics and crime safety, excluding the walking time and satisfaction, while it separated the sidewalks and walking routes from other walking infrastructure. Using NEWS-A, authors in [18] evaluated the objective and subjective residential density, mixed land use, intersection density, and proximity to parks and transit stations in Mexico. Participants with poor socioeconomic levels, no car, and negative park safety perceptions were connected.

World Bank interns created the Global Walkability Index (GWI) to compare walkability worldwide. Primary measures include 14 factors [19]. The GWI initially consisted of 14 parameters and was subsequently reduced to nine [20, 21], because land-use variables, like directness and connectedness, could not be addressed in the short or medium term, since the GWI had not considered them.

Despite the growing global attention, limited empirical research on walkability has been conducted in Middle Eastern contexts, especially in Iraq. Urban planning in Iraqi cities has historically prioritized motorized traffic, often neglecting the needs of pedestrians. Al-Mutanabbi Street in Baghdad is a historically and culturally significant street that has recently been developed into a pedestrian zone. While its transformation aimed to enhance walkability, observable constraints—such as narrow sidewalks, obstructions, inconsistent paving, and poor nighttime lighting—may undermine its functionality as a walkable public space.

The research questions are: what is the current PLoS on Al-Mutanabbi Street, and how does it vary across different sections and times of day? To what extent do physical and perceptual walkability factors affect the pedestrian experience on Al-Mutanabbi Street? What are the most significant barriers to walkability from the perspective of pedestrians? How does subjective satisfaction correlate with objective PLoS metrics (e.g., flow rate, speed, and available space)? What recommendations can enhance the walkability and pedestrian satisfaction on Al-Mutanabbi Street?

The primary aim of this study is to evaluate Al-Mutanabbi Street's walkability as a recreational area with its unique historical and cultural features. This can be accomplished by identifying the walkability components that contribute to a better walking behavior and are appropriate for the study region.

II. RESEARCH METHODOLOGY

Figure 1 illustrates the processes involved in achieving the objectives of this study. In the first step, the study area was selected to monitor, observe, and assess its condition. Data were collected after identifying the required variables based on the assessment methodology. The HCM approach requires quantitative data on the pathway and sidewalk width, speed, and flow. The NEWS-Recreational survey was developed and used to consider the recreational area elements discovered by prior studies. Further sections outline a detailed account of each step with detailed explanations.

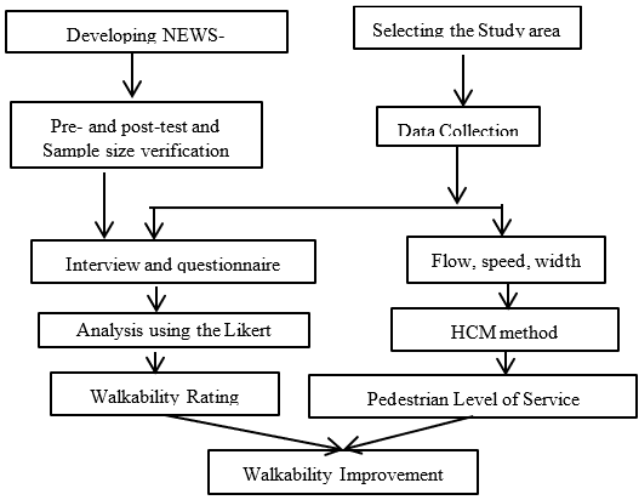


Fig. 1. Research methodology.

A. Description of the Study Area

Al-Mutanabbi Street is situated in the center of Baghdad, near key streets, as portrayed in Figure 2. The map shows the layout and distribution of the assessment zones in the study area, which are represented using colored dots: red for the Al-Saray Zones and blue for the main. To facilitate the data collection, the street was divided into nine zones and eight segments based on intersections, access points, and obstacles that prevent pedestrians from using the sidewalks. Each zone is approximately 36 m apart.

Al-Mutanabbi Street is a significant cultural and historical landmark. Open-air markets for small booksellers were developed on this street, expanding the Al-Saray Street market from the early Abbasid period. Al-Saray Street market has a main entrance on Al-Mutanabbi Street, with a secondary entry located near the Government Printing Press and Al-Mamoon Street [22]. Al-Mutanabbi Street has three accesses, including a

boat crossing of the Tigris River, which adds to its appeal due to the riverbank at the end. Nearby historical sites include Al-Saray Mosque and the oldest Baghdad bridge, Al Shuhada Bridge, on Al-Mamoon Street. Al-Mutanabbi Street is 300 m long, and its width varies from 4 to 6 m, depending on the existing objects, while Al-Saray Market is 140 m long and 4 m wide.

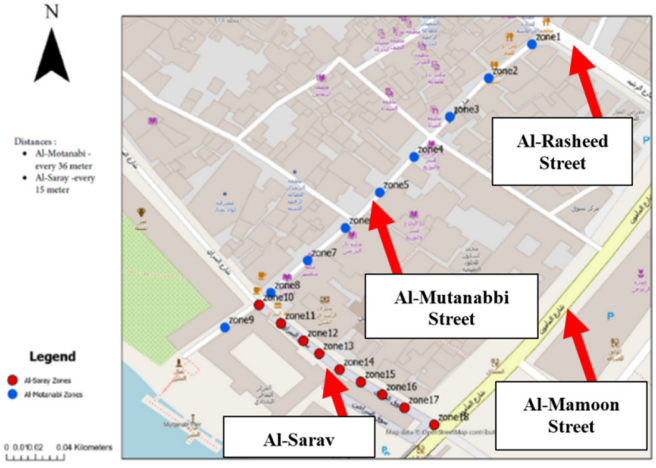


Fig. 2. The Al-Mutanabbi Street (© Google).

This area has undergone significant qualitative alterations and constructional enhancements. Although the street is bustling with several merchants, the pedestrian traffic is challenging, particularly during busy days. During the study period, Al-Mutanabbi Street was frequently congested with shoppers, particularly in the mornings, afternoons, and evenings, due to cultural and recreational activities [22].

B. Data Collection

This stage involved monitoring and observing the research area to determine the weekdays and peak hours of activity. Al-Mutanabbi Street is mainly used for daytime and nighttime entertainment and commerce. According to observation and surveillance, the peak days were Thursday, Friday, and Saturday, with peak times ranging from 10:00 am to 12:00 pm and 7:00 pm to 9:00 pm. The sidewalks on both sides of the road were considered, but businesses close them at night. The study examined the condition, type, and structure of paths, sidewalks, mobility spaces, and road cross-sections, as well as their measurements. The physical characteristics, pedestrian flow, and speed were also recorded.

The physical data include the sidewalk and pathway width, as well as the width of obstacles and fixed objects (W_o), measured using tape measures. The total width (W_t) and effective width (W_e) were calculated as per the HCM methodology [7], where W_e is derived by subtracting W_o from W_t. Table I shows the W_t and W_e of the segments at all the studied hours.

TABLE I. TOTAL AND EFFECTIVE WIDTH OF THE MAIN STREET AND SIDEWALKS

Zones	**Main walkway street**			**Right and left sidewalks**		**Zones**	**Al-Saray branch**	
	W_t (ft)	**W_e (ft) Thursday (10:00 am-12:00 pm)**	**W_e (ft) Friday and Saturday (10:00 am-12:00 pm)**	**W_t (ft) All days**	**W_e (ft) All days**		**W_t (ft)**	**We (ft)**
1-2	22.96	15.744	15.744	9.8	5.7	11	11.48	6.56
3	26.24	20.992	20.992	14.1	10.0	12	11.48	6.56
4	26.24	20.992	20.992	14.1	10.0	13	11.48	6.56
5	26.24	20.992	20.992	14.1	9.2	14	11.48	6.56
6	19.68	13.776	13.776	10.4	5.9	15	11.48	6.56
7	16.40	10.496	10.496	10.4	5.9	16	11.48	6.56
8	16.40	10.496	10.496	13.8	8.9	17	11.48	6.56
9	16.40	10.496	6.560	13.8	8.9	18	11.48	6.56
Zones	**W_t (ft)**	**W_e (ft) Thursday (19:00-21:00)**	**W_e (ft) Friday and Saturday (19:00 -21:00)**	**W_t (ft) All days**	**W_e (ft) All days**	**Zones**	**W_t (ft)**	**W_e (ft)**
1	22.96	22.96	15.744	0	0	11	11.48	6.56
2	22.96	22.96	15.744	0	0	12	11.48	6.56
3	26.24	26.24	20.992	0	0	13	11.48	6.56
4	26.24	26.24	20.992	0	0	14	11.48	6.56
5	26.24	26.24	20.992	0	0	15	11.48	6.56
6	19.68	19.68	13.776	0	0	16	11.48	6.56
7	16.40	16.40	10.496	0	0	17	11.48	6.56
8	16.40	16.40	10.496	0	0	18	11.48	6.56
9	16.40	16.40	10.496					

In Table I, zones 1-9 represent the main walkway and side sidewalks, while zones 11–18 represent the Al-Saray branch, a secondary path. Measurements were taken during two peak periods: morning (10:00 am – 12:00 pm) and evening (7:00 pm – 9:00 pm). It has been noted that the W_e of the main walkway and the sidewalks differed during the day from the W_e in the evening. This is due to sellers transferring items from the main walkway to the sidewalks after 6 pm. Zones 3-5 have the widest effective widths, indicating better walkability. Zones 7-9 show a decrease in the W_t, highlighting narrow sidewalks and potential pedestrian congestion.

The speed was measured using:

$$Speed = \frac{D}{T} \quad (1)$$

where D is the distance of the segment in ft, which was marked at the ground to ensure the accuracy of the measurement, and the tape was used to measure the distance. *T* is the difference between the start-up and end-up times when passing the segment in s; it was measured using a stopwatch. The speed was determined as the average of a sample of 15 people at each segment and each hour of the data collection. To check the accuracy of the measured speed, the mean was measured for each segment, and the standard deviation was measured using:

$$Standard\ Deviation = \sqrt{\frac{\sum(SPi - mean\ speed)}{14}} \quad (2)$$

where SPi is the speed for pedestrian I, 14 is the sample size minus one, as the sample size was 15 for each segment. The standard error was then computed using (3) to reflect the accuracy of the mean speed in estimating the population speed:

$$Standard\ Error = \frac{\sqrt{Standard\ Deviston}}{15} \quad (3)$$

The results at peak hours are depicted in Table II. The lower values of the standard error at the Al-Saray branch and the main street reflect that the speed of pedestrians is more consistent and reliable than other segments.

TABLE II. SELECTED MAXIMUM V15 FOR THE STUDY AREA

The road section	Day and time (peak hour)	We (ft)	Peak V15 (p/15 min)	Mean speed (ft/sec)	Standard deviation	Standard error
Main walking path	Friday (20:00-21:00)	16.4	1168	1.341	0.179	0.0462
Right sidewalk	Friday (10:30:11:30)	10.0	68	0.9215	0.303	0.0782
Left sidewalk	Friday (10:15-11:15)	5.70	305	1.786	0.2697	0.0696
Al-Saray branch	Thursday (20:00-21:00)	6.56	456	1.1271	0.1294	0.033

Table II presents the analysis of the peak pedestrian flow (V15) data, representing the number of pedestrians counted over 15-min intervals at the main walkway, right sidewalk, left sidewalk, and Al-Saray branch. It also presents physical characteristics, such as the effective width (W_e), and performance metrics, including the mean pedestrian speed, standard deviation, and standard error. At the main street, the peak period was Friday, 20:00–21:00, with a peak V15 of 1168 pedestrians per 15 min, and the wind speed at this time was 16.4 ft The main street recorded the highest pedestrian volume in the entire study area. Although the mean walking speed remained moderately stable, the high volume indicates extremely dense pedestrian movement during this peak hour. The relatively low variability (standard deviation and error) suggests a uniform flow under crowd pressure but also points to a potentially saturated condition that could strain the comfort and safety without active management.

Table II also shows that on the right sidewalk, the peak period was Friday, 10:30–11:30, with a peak V15 of 68 pedestrians per 15 min, and w_e was 10 ft away. Despite having a moderate width, the low volume and significantly reduced speed suggest functional inefficiencies. The high variability in speed implies the presence of obstacles or informal activities, which can disrupt the pedestrian continuity. This indicates a misalignment between the available space and effective utilization. On the left sidewalk, the peak period was Friday from 10:15 to 11:15, with a peak V15 of 305 pedestrians per 15 min and a W_e of 5.7 ft. This narrow section showed the highest walking speed across all locations, indicating a more dynamic and purposeful pedestrian flow. A moderate-to-high flow rate on a constrained width may reflect efficient use by through-moving pedestrians, but it could also lead to safety issues or discomfort during sustained or increasing volumes.

At the Al-Saray Branch, the peak period occurred on Thursday from 20:00 to 21:00, with a peak of 456 pedestrians per 15 min and a speed of 6.56 ft/min. This section demonstrated consistent performance, characterized by stable walking speeds and relatively low variability. It handles moderate volumes well, suggesting that the design is adequate for the current demands. However, the limited width may constrain future growth or high-density events.

C. Modified NEWS Questionnaire (NEWS-Recreational)

The study area's walkability is assessed using a new questionnaire that accounts for most parameters reported in earlier studies. The questionnaire (NEWS-Recreational) has two components. The first component, demographic questions, describes respondents' gender, age, occupation, monthly income, highest or current degree, car ownership, and type of car. The second section asks about Al-Mutanabbi Streets' walkability. The electronic and roadside questionnaire was designed using the Kobo program and collected utilizing tabs at the roadside. Table III lists a set of 21 items that cover aspects, such as safety, accessibility, comfort, and satisfaction. These criteria were adapted from international guidelines and validated instruments, including the HCM 2010 [7], the NEWS [11], and the GWI [19] to ensure compatibility with the best global practices in walkability assessment. The study developed specific criteria to reflect the local context and visitor-specific concerns. These elements are critical in evaluating cultural and recreational streets, such as Al-Mutanabbi Street.

Two pre-and post-tests were conducted to verify the questionnaire's reliability and validity. The questionnaire was pre-tested by subject matter experts to assess the questions, multiple-choice options, and content. A small sample (approximately 30) of popular individuals was given the questionnaire to identify its weaknesses, such as long, repetitive, or unclear questions. The interviewers ask the respondents to explain each questionnaire item and their responses are provided orally or in an open-ended manner. Based on that, the questionnaire was updated.

Stability measures the reliability of the questionnaire, which reflects its consistency over time. Cronbach's Alpha was used to measure the stability coefficient, which varies from zero (low stability) to 1 (high stability) [23]. Validity measures

whether the questionnaire accurately reflects the concept it is intended to measure; the validity coefficient is mathematically identical to the squared stability coefficient [24]. The SPSS IBM Statics 25 application calculated the reliability and validity coefficients for Al-Mutanabbi Street's question group using Cronbach's Alpha. Cronbach's Alpha was (0.809) close to 1.0, indicating significant internal consistency [25]. Therefore, the questionnaire is stable and valid.

TABLE III. LIST OF ITEMS IN DEVELOPED NEWS-RECREATIONAL QUESTIONNAIRE

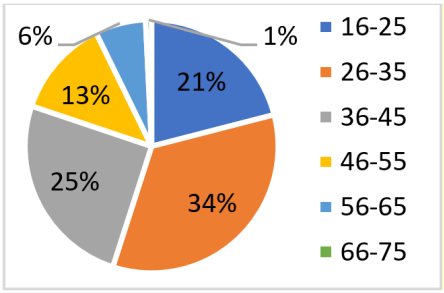
No	Items	Source
1	PLoS while walking	HCM 2010 [7]
2	Suitability of walkways and sidewalks	NEWS [11] and GWI [19]
3	Validity for older people and the disabled	GWI [19]
4	Validity of the width and space for walking during the day	HCM 2010 [7]
5	Validity of the width and space for walking at night	HCM 2010 [7]
6	Validity of the paving surface	NEWS [11]
7	Level of safety	NEWS [11]
8	Absence of physical obstacles	NEWS [11] and GWI [19]
9	Adequate lighting at night time	NEWS [11] and GWI [19]
10	comfort and safety at night time	NEWS [11] and GWI [19]
11	Absence of conflicts with other pedestrians	NEWS [11]
12	Safe distances from other pedestrians	HCM 2010 [7]
13	Pedestrian speed	HCM 2010 [7]
14	Absence of causes for walking delay	NEWS [11] and GWI [19]
15	Fun, interest, and encouragement to walk	NEWS [11] and GWI [19]
16	Presence of seats and the necessary furniture for visitors	Added by authors
17	Availability of essential services for visitors	Added by authors
18	Feeling of satisfaction	Added by authors
19	Street for tourists	Added by authors
20	Weather conditions	GWI [19]
21	Access to Al-Mutanabbi Street	NEWS [11] and GWI [19]

To check the accuracy of the collected sample size (392), the latter was been compared with the minimum sample size obtained using [26]:

$$n = z^2 . \frac{[p \times q]}{d^2} \quad (4)$$

where n is the minimum sample size, p is the estimated proportion of the study variable or construct based on prior research or pilot studies, q = 1-P, d is the margin of error (5%), and Z is the Z-score (1.96 for confidence level 95%). The minimum sample size is approximately 323 respondents for a 70% confidence level and 384 for a 50% confidence level. Since the collected data were from a sample of 392 respondents, which is greater than the estimated minimum sample size, it is acceptable and can be used to obtain reliable results.

(a)



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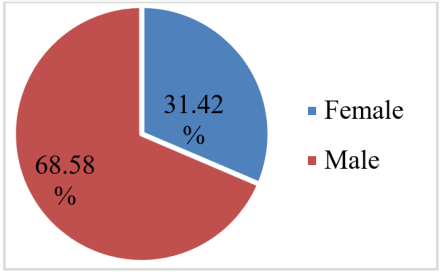

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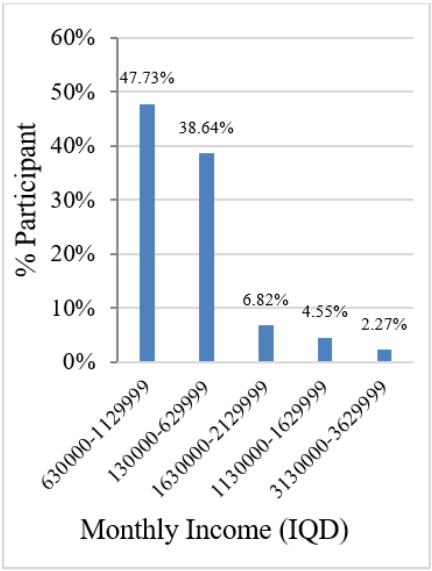

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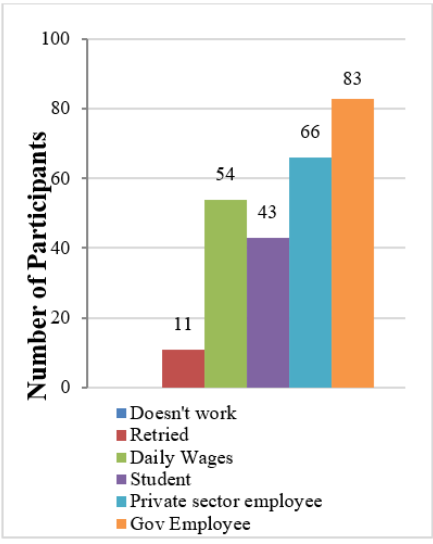

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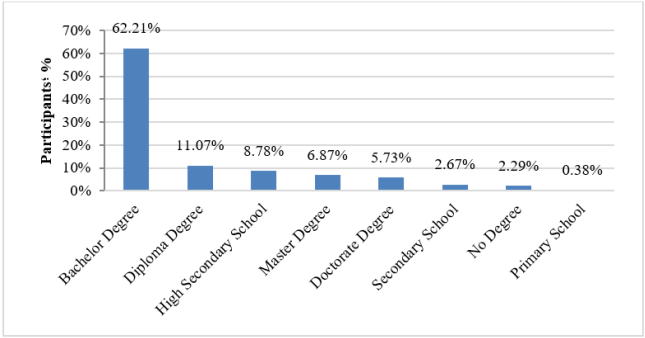

Fig. 3. Demography of respondents: (a) percentage of respondents according to age, (b) percentage of respondents according to sex, (c) percentage of respondents according to monthly income, (d) percentage of respondents according to profession, (e) percentage of respondents according to education.

Figure 3 illustrates the distribution of the respondents by demographic characteristics. Figure 3(a) shows that the age of the respondents ranged from 16 to 75 years old. The highest participation rate (34%) was observed among individuals aged 26–35 years, while the lowest rate (1%) was among those aged 66–75 years. This is due to accessibility issues and the difficulty older people face in reaching Al-Mutanabbi Street. Figure 3(b) demonstrates that males made up the majority of the survey respondents (68.58%) due to the location and business nature of the research area. The monthly income was also considered, but due to its sensitivity, only 44 people in both streets responded, with the highest rate (47.73%) among those earning less than 1,300,000 IQD, as shown in Figure 3(c). According to the respondents' professions, as displayed in Figure 3(d), the government personnel constituted the largest group (83%), followed by the private sector employees (66%). According to the respondents' education levels, Figure 3(e) exhibits that the majority hold bachelor's degrees (62.21%), followed by diplomas (11.07%) and postgraduate degrees (6.87% and 5.73%). Al-Mutanabbi Street is Iraq's main book street, and most visitors are students or recent graduates seeking further research.

D. Analytical Procedure

The analysis of the Likert Scale has been used to assess the overall evaluation of the study area. To accomplish this, the questions included in the NEWS-Recreational questionnaire were categorized into eight distinct groups. These groups are: the overall PLoS, the physical characteristics of pedestrians' facilities, safety, and security, facilities for the elderly and disabled, characteristics of pedestrian movement, supporting facilities and amenities, weather conditions, and accessibility. In the Likert analysis, a six-point scale ranging from 1 (for "Very Poor") to 6 (for "Excellent") was used. A computation was performed to determine the mean of the choices made by the respondents, and the findings are presented below.

III. RESULTS AND DISCUSSIONS

A. Results of the HCM Method

Table IV shows that the HCM approach yields PLoS "F" at all portions, indicating minimal speed and space, as well as frequent pedestrian contact, in accordance with HCM 2010 [7]. In the PLoS, the space, and speed are below the minimum parameters, while the flow rate and volume-to-capacity (v/c) ratio are low.

1) Main Walking Path

This section experienced the highest pedestrian flow rate (Vp = 4.75 p/min/ft) and a very low space per person (S_p = 0.282 ft²/p), indicating extremely congested conditions. Although this is the widest facility, the intense usage during the peak period leads to a Level "F" service, primarily due to insufficient space and reduced pedestrian speed. These conditions reflect a critical need for crowd management or capacity enhancement during the peak hours.

2) Right Sidewalk (Zone 3)

Despite its relatively low pedestrian flow rate (V_p = 0.453) and a generous space per person (S_p = 2.03 ft²/p), this sidewalk still registers a level "F". This anomaly likely stems from the speed disruptions, possibly caused by physical barriers, informal activities, or poor surface conditions. The low v/c ratio (0.020) confirms that the problem is not the capacity but the flow efficiency.

3) Left Sidewalk (Zone 3)

This section displays a moderate pedestrian flow (V_p = 3.57) with limited space (S_p = 0.501 ft²/p), resulting in a PLoS "F". Although the performance is slightly better than that of the right sidewalk, the limited space and moderate usage make it prone to bottlenecks, especially during brief surges in demand.

4) Al-Saray Branch (Zone 5)

With a flow rate similar to the main walking path (V_p = 4.63) and even less space per pedestrian (S_p = 0.243 ft²/p), this section experiences intense crowding. It shares the PLoS "F" designation due to limited width, making it highly vulnerable to discomfort and reduced mobility during the peak hours.

B. Results of NEWS-Recreational Method

Table V presents the results of the NEWS-Recreational study. It contains the results of the calculation of the mean of the choices made by the respondents. It can be seen that the overall PLoS for the study area was rated as "Good," with an average score of 4.0. This indicates that, in general, pedestrians are satisfied with their walking experience in the corridor. However, a breakdown of the subcategories reveals specific areas that require targeted improvement.

TABLE IV. RESULTS OF PLOS

The road section	Day and time (peak hour)	V_p (p/min/ft)	S_p (ft²/p)	v/c	PLoS	The determinations
Main walking path (Zone 9)	Friday (20:00-20:15)	4.74797	0.282	0.206	F	Space and speed
Right sidewalk (Zone 3)	Friday (10:30:10:45)	0.45333	2.032	0.020	F	Space and speed
Left sidewalk (Zone 3)	Friday (10:15-10:30)	3.56725	0.501	0.155	F	Space and speed
Al-Saray branch (Zone 5)	Thursday (20:00-20:15)	4.63415	0.243	0.201	F	Space and speed

TABLE V. RESULTS OF LIKERT ANALYSIS OF NEWS-RECREATIONAL QUESTIONNAIRES' RESPONSES

Questions	Mean	Descriptive interruption
Overall PLoS		
Q1	4.0	Good
Physical characteristics		
Q2	3.9	Good
Q4	3.1	Moderate
Q5	3.3	Moderate
Q6	3.5	Good
Q8	3.0	Moderate
Average	3.4	Moderate
Pedestrian movement		
Q11	3.1	Moderate
Q12	2.9	Moderate
Q13	2.7	Moderate
Q14	2.9	Moderate
Average	2.9	Moderate
Elderly and disability facilities		
Q3	3.3	Moderate
Safety and security		
Q7	4.4	Good
Q9	4.7	Very good
Q10	4.6	Very good
Average	4.6	Very good
Supporting facilities		
Q15	3.8	Good
Q16	4.0	Good
Q17	5.2	Excellent
Q18.	3.7	Good
Q19	3.6	Good
Average	4.1	Good
Weather conditions		
Q20	3.1	Moderate
Accessibility		
Q21	3.3	Moderate
Overall rating	3.6	Good

1) Physical Characteristics

The physical characteristic category received an average score of 3.4, corresponding to a "Moderate" rating. While some aspects, such as path surface and width (Q2 and Q6), were rated positively, other elements, like shading, lighting, and slope (Q4, Q5, Q8) were rated lower. This suggests inconsistencies in the infrastructure quality.

2) Pedestrian Movement

With an average score of 2.9, this category was also rated as "Moderate". All related questions (Q11 to Q14) indicated that pedestrians may face issues, such as crowding, obstructions, or inadequate pedestrian flow management. It is proposed to consider interventions, like wider sidewalks, dedicated pedestrian zones, and improved signal timing to facilitate a smoother movement.

3) Elderly and Disability Facilities

The facilities for the elderly individuals and persons with disabilities received a "Moderate" rating with a score of 3.3 (Q3). This indicates an insufficient level of accommodation for vulnerable users. Enhancements should include ramps, tactile paving, accessible signals, and seating areas to serve these groups better.

4) Safety and Security

This category achieved a high average score of 4.6, classified as "Very Good". Pedestrians expressed strong confidence in the safety and security measures in place, such as lighting and surveillance (Q7, Q9, and Q10). These standards should be preserved and extended to other parts of the corridor to ensure consistent safety.

5) Supporting Facilities

Supporting amenities, including benches, signage, and shade structures, were rated as "Good", with an average score of 4.1. Notably, Q17 received a score of 5.2, indicating exceptional satisfaction. These successful elements should be replicated across other locations to enhance the overall satisfaction.

6) Weather Conditions

Weather-related comfort was rated "Moderate" with a score of 3.1 (Q20). The result suggests that pedestrians may experience discomfort due to sun exposure, rain, or wind. The installation of weather protection elements, such as covered walkways and shaded areas, is proposed.

7) Accessibility

Accessibility was also rated "Moderate", with a score of 3.3 (Q21). This reflects challenges in approaching and entering pedestrian areas, likely due to poor signage or design constraints. Improvements in signage, entry points, and continuous pathways are proposed.

C. Comparative Insights

The overall score of 3.6 reflects a "Good" LoS. While pedestrians generally perceive the walking environment positively, specific interventions are needed to enhance the "Moderate" rated areas, particularly in terms of movement, accessibility, and inclusivity for the elderly and disabled users. Sustaining high-performance elements, such as safety and supporting facilities, will further enhance the corridor's overall pedestrian experience.

The difference between the HCM and NEWS-Recreational methodologies suggests the possibility of bias in the data. The HCM approach uses quantitative, infrastructure-based criteria (e.g., pedestrian flow and space). While it is effective in measuring physical and movement features, it overlooks the emotional and perceptual dimensions of the pedestrian experience. As a result, it may underrepresent the user dissatisfaction. The NEWS-Recreational tool, on the other hand, includes perceptual factors. Subjective self-reporting can introduce response bias, such as social desirability or adaptive behavior, to long-term deficiencies. The modified NEWS-Recreational survey incorporates a mixed-methods approach combining objective evaluations with enhanced perception-based tools and qualitative feedback.

The findings of this study are consistent with conclusions from previous studies that critique the limitations of traditional infrastructure-focused assessments, such as HCM, as noted in [9, 10]. This study aligns with their findings, showing that while HCM yielded poor service levels due to the constrained width and low speeds on Al-Mutanabbi Street, the NEWS-

based evaluation captured higher satisfaction scores, particularly in terms of safety and supporting facilities. Additionally, this study is consistent with the findings of [13, 14], reinforcing that the perceived walkability is positively associated with higher pedestrian satisfaction, especially in recreational zones where aesthetic, cultural, and experiential elements are vital. This is also observed in [15, 16], where the subjective perceptions significantly influenced the walkability ratings. The findings of this study align also with the results of [27], where the role of perception-based evaluation in assessing the transportation service quality was emphasized. Both studies advocate for a user-centered evaluation framework, recognizing that the physical parameters alone cannot adequately reflect the user experience in transportation or pedestrian environments. The emphasis placed in [27] on including sociodemographic and perceptual feedback mirrors the structure of the NEWS-Recreational survey used in the current work, which considered variables, such as comfort, perceived safety, and accessibility.

The current study's integration of perceptual and physical measures through the NEWS-Recreational framework finds notable alignment with the findings of [28], which explored the key components influencing the walking behavior in Baghdad City. The study emphasized the significance of the environmental aesthetics, perceived safety, and cultural factors as key motivators for the pedestrian activity, especially in mixed-use and recreational corridors. Furthermore, the it was highlighted that the pedestrian behavior in Baghdad is influenced by non-technical dimensions, including street heritage, visual appeal, and social interaction—factors that are effectively captured by the subjective dimensions of the NEWS-Recreational tool but are absent in the HCM methodology.

The findings of this study resonate strongly with the conclusions drawn in [29], where infrastructure was modeled as a latent variable within the broader context of the active transportation mode choice in Baghdad. The structural equation modeling in [29] demonstrated that while the infrastructure availability is crucial, it indirectly affects the mode choice through mediators, such as perceived safety, convenience, and environmental quality—paralleling this study's revelation that the physical constraints (evident in the HCM's PLoS "F" rating) do not fully explain the user satisfaction, which was notably high under the NEWS-Recreational framework. The results of this study are conceptually aligned with those of [30], where the pedestrian accessibility to bus stops was assessed using GIS-based spatial analysis. The authors focused on the impact of the infrastructure quality, safety barriers, and urban form limitations. Their findings align with the results of the current study in supporting the shift from distance-based access to experience-based usability. It was also concluded that true accessibility and pedestrian satisfaction must incorporate the user perceptions, safety, and environmental quality, not just spatial or flow criteria. The findings of this study also align with the findings in [31]; both studies share a common emphasis: user perception is indispensable in assessing walkability, and both agree that walkability improvements must address safety, inclusivity, and experiential quality, not just the structural dimensions.

IV. THE WALKABILITY IMPROVEMENTS

Proposals for improvements based on global walkability studies and projects, as well as the weaknesses of the existing characteristics involve:

- Implementing comprehensive upgrades to physical infrastructure, including uniform lighting, shading, and sidewalk surfacing.
- Expanding and prioritizing pedestrian-only zones to alleviate crowding and improve the flow.
- Increasing the accessibility through curb ramps, tactile paths, and clear signage, especially at entry/exit points.
- Installing weather protection elements, such as canopies and shaded rest areas.
- Providing enhanced amenities, like waste bins, and seating at regular intervals.
- Maintaining and replicating successful safety and facility features in other segments of the corridor.
- Conducting periodic user satisfaction surveys to monitor progress and refine the future interventions.

V. CONCLUSIONS

In this research, a new survey form, the Neighborhood Environment Walkability Scale (NEWS)-Recreational survey, has been developed to account for the unique elements of the recreational areas that traditional methods have not considered in walkability assessments. The survey contains questions selected from other traditional survey forms, such as the conventional Neighborhood Environment Walkability (NEW) and Global Walkability Index (GWI) forms, as well as additional questions added to consider the requirements of walkability in recreational walkways. The developed survey form has been used to collect responses from pedestrians walking on Al-Mutanabbi Street in Baghdad City. The results of the response analysis were compared to those of the Highway Capacity Manual (HCM) method. The developed survey is more comprehensive than HCM method, as it considers aspects not covered in HCM, particularly the perception approach. By incorporating these qualitative dimensions through the adapted NEWS-Recreational questionnaire, this study contributes to the growing body of evidence suggesting that mixed-method approaches offer a more comprehensive assessment of pedestrian environments than purely quantitative models, such as the HCM.

According to the NEWS-Recreational survey, AL-Mutanabbi Street was rated "Good," with pedestrians rating it "Very Good" for feeling safe from cars and bicycles because it is exclusively for pedestrians. The lighting and security make nighttime street strolling a secure experience. Additionally, pedestrians rated the supported services at Al-Mutanabbi Street the highest, and the overall rating of amenities and supporting facilities, such as access to historical sites, river trips, local folklore cafes, and traditional food restaurants, was "Good."

On the other hand, the HCM approach placed the street in Pedestrian Level of Service (PLoS) "F," the lowest level among

the six levels. This differs from the NEWS-Recreational questionnaire approach because it solely analyzes physical and movement features, ignoring pedestrian perception and the elements of recreational areas. According to the NEWS-Recreational technique, pedestrians ranked the research area's physical and mobility qualities as "Moderate," which is likewise unacceptable. This means that these qualities should be considered when improving the study area's walkability. The subjective technique of assessment for this type of study includes pedestrians' perceptions and opinions, which are the most essential indicators of their acceptance of the integrated circumstances. The HCM approach utilizes requirements that may not apply to all conditions and trips.

For further research, it is proposed to utilize the NEWS-Recreational survey to assess the walkability of the area surrounding Al-Mutanabbi Street, particularly Al-Rasheed Street and Al-Mamoon Street, to identify the weaknesses that deter people from walking in this area and improve the walkability features. It is also proposed to develop a survey form for the elderly and disabled individuals to assess the study area and its surrounding environment, identifying and improving the features that encourage them to visit the area.

DATA AVAILABILITY

The data were collected through field surveys, and can be made available upon request.

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