ISSN 2729-7640

sciendo

ALFA ARCHITECTURE PAPERS
OF THE FACULTY OF ARCHITECTURE AND DESIGN STU
www.alfa.stuba.sk

2/2022 (Vol. 27)
DOI: 10.2478/alfa-2022-0008

Assessing the urban design qualities of the urban street: A case study of Sylhet, Bangladesh

Mohammad Tanvir Hasan[1]*

Md Mustafizur Rahman[2]

Tanjima Siddika[3]

[1,2] Shahjalal University of Science and Technology, Department of Architecture, Sylhet, Bangladesh

[3] Leading University, Department of Architecture, Sylhet, Bangladesh

***Corresponding author**
E-mail: tanvir-arc@sust.edu

Article information
Sent: Feb 28, 2022
Accepted: May 9, 2022

Abstract: Shortage supply of space for urban infrastructure including street and pedestrian aspects remains a great challenge in the context of Bangladesh due to the rapid growth of urbanization. Here, overcrowded cities can hardly manage space for walking, the safest mood of public mobility. In Sylhet, a city in north-eastern Bangladesh, widening the vehicular street and decorating pedestrian pathways is the common tendency of street development by the local authority where the quality of urban streets is rarely investigated. In most research, walking preferences are measured via a quantitative method by addressing street comfort, traffic, and size rather than the urban design qualities of the street, i.e. a qualitative approach. Hence, the project aims to identify the user preferences for walking in the Zindabazar area, a commercial street of Sylhet considering the urban designs qualities like enclosure, legibility, human scale, transparency, complexity, coherence, linkage, and imageability. Therefore, this research applied a questionnaire survey, conducted to analyse the relation between walking preferences and urban design qualities of the commercial street. After collecting Likert scale data, Linear and multiple regression models were used to analyse it. Regression analysis was conducted to identify the relation between urban design qualities and user preferences for walking on the proposed street. The research identified that walking preferences of user are not significantly associated with all the factors of urban design qualities except legibility, transparency, and human scale. The research will help identify the poor and significant urban qualities of the street(s) which need to be modified to improve user preferences.

Keywords: urbanization, mobility, urban design qualities, walking preferences, Zindabazar

INTRODUCTION

Among all other transportation systems, pedestrian walking is the only way from which a human can get health, social, and environmental benefits. As a major category of urban structure, a pedestrian way interconnects various land uses by human foot and acts as the edge of the district as well as an interface between public and private property. As a significant urban space, a pedestrian way is a memorable element in cities (Woolley, 2003) where people move on and compose their mind map about the city that generates an attractive image in a people's mind and contains numerous kinds of apparatus for walking, refreshment, retailing, communication, lingering, aggregation and interchanging the cultural affairs. Various research show the relation between walkability and the physical features of the street which can be measured objectively. Mostly the preference for walking has investigated the element of the street but preference also includes the perception developed by the quality of the street (Ernawati et al., 2018). The improvement of the physical element may enhance the preference to walk but could not satisfy the perception of an individual completely. The perception may vary from person to person which can be measured subjectively. Ewing and Handy (2009), and Purciel and Marrone (2006) have developed a comprehensive method to measure the urban design quality of the street by the perception of the mediator in a quantitative way.

In Bangladesh, presently no research has been conducted yet that would focus on the urban design quality of the street to promote walkability. Therefore, a significant research gap in the field of urban design to understand the relation between walking preference and the design quality of the street, is quite evident.

Sylhet is a city in north-eastern Bangladesh and the land is of religious and natural significance. But the scenario of poor pedestrian quality is also a major problem similar to other cities in Bangladesh. Due to the growing trend of urbanization, infrastructure development took place to meet the demand in Sylhet. The Old Street is getting wide, a pedestrian way is placed beside the street, and a new drainage line has been installed. However, these changes in physical features greatly affect the on-street environment. In this paper, the authors have discussed the characteristics of urban street quality and their connections which have underlined the user preference during walking within the proposed study area.

Conceptual framework

The research is based on the concept derived from Ewing and Handy (2009) shown in Figure 1. The figure shows a linear relation between walkability, physical features, urban design quality, and user perception of the urban streets. The user reaction depends on physical features and urban design qualities. However, urban design qualities are diverse from individual reactions like the sense of comfort, sense of safety, and level of interest (Ewing, Handy, 2009). It reflects individual reaction and assessment of a place but perceptions are simply perceptions. Mostly, the research aimed to identify the walkability of the streets considering physical features which is an objective measurement process. Urban design qualities, composed of physical features, an intangible character, remain undetermined in the research. Therefore, this research purposes to understand the relationship between urban design quality and user reaction.

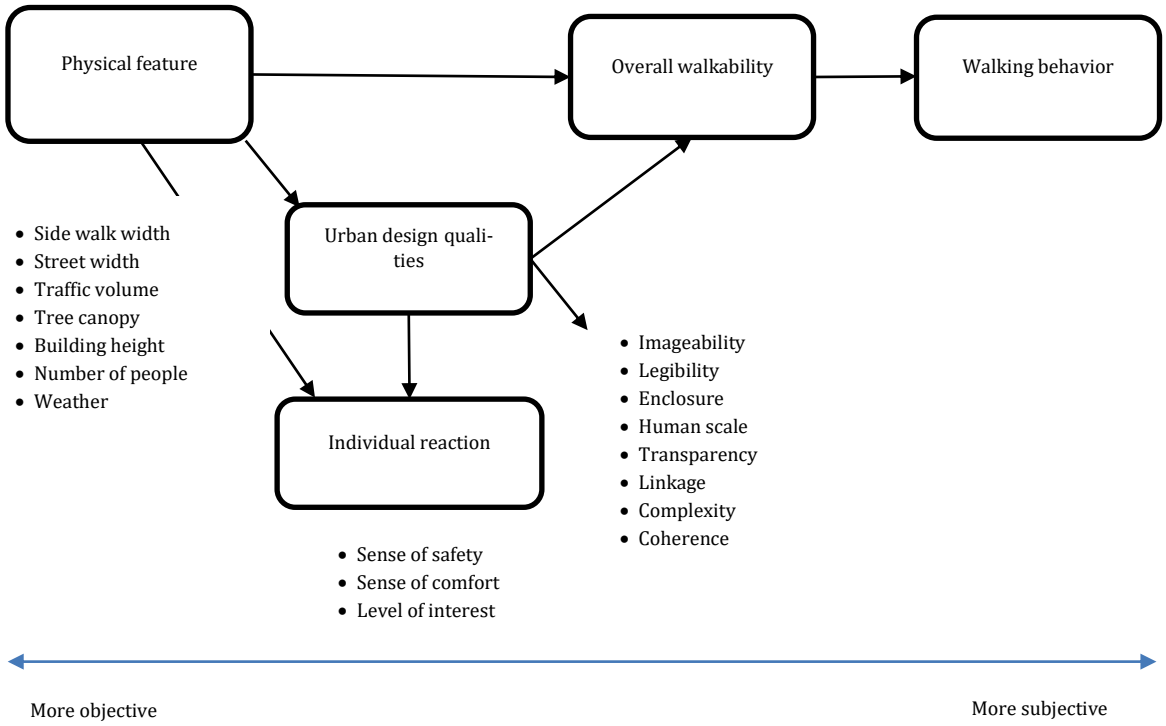

Fig. 1. Conceptual framework. (Source: Ewing, Handy, 2009)

Scenario of the case study area

The case study area is a segment of a major artery of the Sylhet city (in Bangladesh) situated beside the old central business district (CBD) which connects the southern part with the north one. It is considered an old commercial street of Sylhet. Consequently, several post-colonial market and old heritage buildings are located on Zindabazar Street. The street is connected with the east and west artery in the Chawhatta node (see Fig. 2). Since the street accommodates old small retail businesses to modern shopping malls, so the composition of different urban forms and buildings is quite evident (see Fig. 3). The research area starts from the Zindabazar node to the Chawhatta node where few cross-road connections are available (see Fig. 4). Most of the land around Zindabazar is used for commercial or business purposes. Besides, the street accommodates public places like Shahid Minar, old heritage buildings, restaurants, hospitals, several educational institutions, and other public amenity services (see Fig. 5).

Fig. 2. Location of the case study area. (Source: Google Earth, modified by the authors)

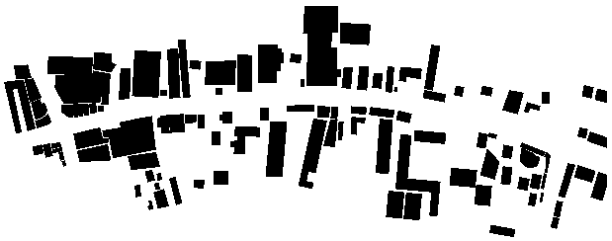

Fig. 3. Figure ground map. (Source: authors)

Fig. 4. Existing road network. (Source: authors)

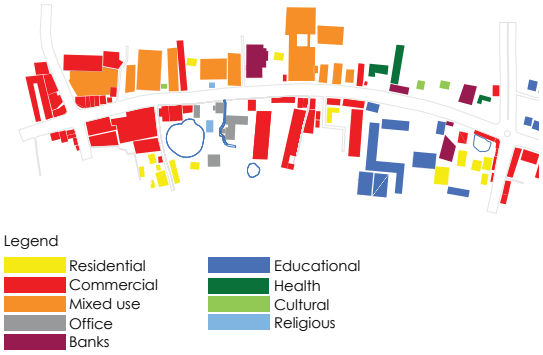

Fig. 5. Existing land use map. (Source: authors)

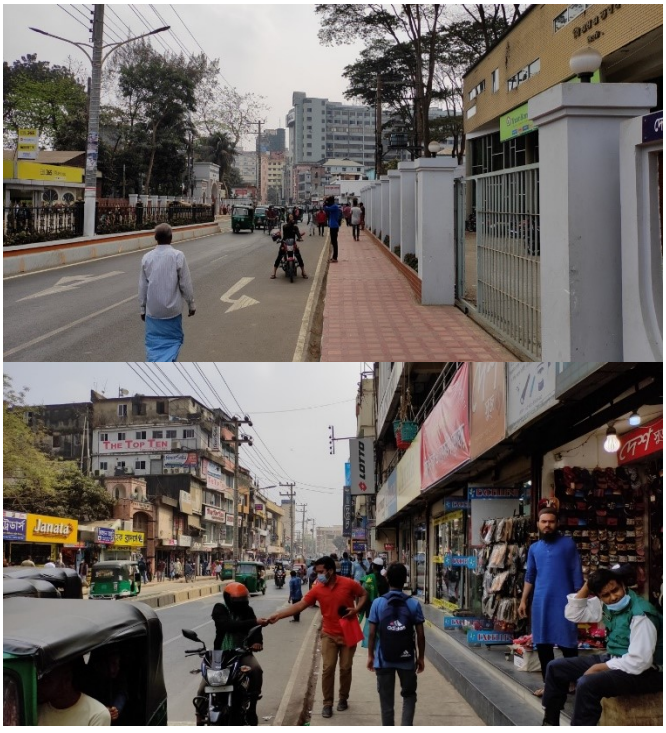

Fig. 6. Image of Zindabazar Street. (Source: authors)

LITERATURE REVIEW

Significance of street as public space

According to Carmona in 2013 and Jacobs in 2016, we can examine the function and form of streets in terms of their qualities which gives scope for great diversity: visually dynamic or visually static, enclosed or open, long or short, wide or narrow, and straight or curved. In addition, it is stated that the main public spaces of a city are the most vital organs (Carmona et al., 2013). On the other hand, in 2014, Oranratmanee and Sachakul defined a street as the widest and most accessible public space that creates more possibilities for social activities and connections. It generates several multifunctional spaces and its role should be understood from various perspectives. Therefore, a street can be defined as a physical space, a channel of movement and a public realm, and lastly, as a place.

Street as physical space and channel of movement

Jane Jacobs (2016) mentioned that streets create a place of social interactions, vitality, and a sense of community. For thousands of years, streets have been the epicentre of the social, cultural, and economic life of the city (Engwicht, 1999). For determining the character of a street, movement is the most important feature (Telford, 2007); in this way, the main and primary purpose of a street is easy accessibility designed for both traffic and pedestrian movement. Although these two kinds of street movements are for circulation only, Jacobs (1961) defines that both of them have possibilities for social interactions and cultural exchanges, for example window shopping; a talk with a friend: this is true for the pedestrian movement and is lacking for vehicular movement, unless the car is parked. On the other hand, public spaces like an urban square give a visual static attractiveness while streets are visually vibrant which creates a sense of movement. As a channel of movement, streets have several functions, such an instant one—it connects one place to another; and these are used by people to move from one place to another whether on foot or by car (Sholihah, 2005; Sammas, 2008). It also provides a link between buildings, both within the street and in the city at large. The researchers have identified various activities regarding the use of streets as a channel of movement (see Tab. 1).

Tab. 1. Functional uses of the street. (Source: Sammas, 2008; Sholihah, 2005; cited: Eichner, Tobey, 1987; Obeidy, Shamsuddin, 2017).

▪ Vehicular Circulation	▪ Emergency vehicle
▪ Through movement	▪ Pedestrian Circulation
▪ Picking up/dropping off passengers	▪ Through movement
▪ Curb side parking	▪ Waiting for, boarding and alighting from vehicles (buses, taxis, cars)
▪ Access to parking	
▪ Buses	▪ Entering and leaving subways
▪ On-street service	▪ Crossing streets
▪ Off-street service	▪ Entering and leaving buildings

Urban design qualities of a street

Imageability is a word that means the physical features of an urban design that define its uniqueness within its environment, a sense of place that permits its inhabitants to define it, and an aspect in determining the quality of space by eliciting powerful, lasting memories. The capacity of any physical thing to elicit a solid image for any particular observer by presenting instrumental and relevant mental pictures or patterns is referred to as its imageability (Ewing, Handy, 2009). Imageability is a quality of a physical environment that evokes a strong image in an observer: *"It is that shape, colour, or arrangement which*

facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment." (Lynch, 1960)

Legibility is a perceptual quality that enables easier navigation and more accurate mental images of a place by recognizing its spatial fabric. Visual terminations focus on the community, as well as put a definite endpoint to streets to keep them from going on forever (Duany, Plater-Zyberk, 1992). *"Since they have to start and stop somewhere, these points should be well marked."* (Jacobs, 1993)

The term "enclosure" refers to the extent to which streets are enclosed. Buildings, walls, trees, and other vertical features create and define public areas aesthetically. It has a distinct and definite shape, as definite as the shape of important as the shapes of the buildings which surround it (Alexander et al., 1977). Some configurations of structures create highly three-dimensional environments (Hedman, 1984).

The human scale is a term that narrates how individuals view a location. It is connected to the overall enunciation of a physical area and the distance of time required to understand a particular quantity of information, and it bases its standards on typical human comfort measures. Personal interaction distances have a role in human-scale design. These lengths are as follows:

1. Intimate distance 0–1.5 ft (about 0-0.5 m)

2. Personal distance 1.5–4.5 ft (about 0.5-1.3 m)

3. Social distance 4.5–12 ft (about 1.3-3.7 m)

4. A person's face is only recognized at a distance of 70 feet (about 21 m), a loud voice can only be heard at a distance of 70 feet, and a person's face is only recognizable in portrait-like detail at a distance of approximately 48 feet (about 15 m) (Gehl, 1987) and (Alexander et al., 1977).

Transparency denotes the degree to which people may understand or perceive human activities beyond the edge of a highway or other public space. Transparency is a precondition for openness. It mentions two separate architectural elements: the capacity to look beyond the street boundary and the existence of indications of tenancy beyond the street edge (Polívka, Reicher, 2019). Allan Jacob stated that *"Streets with many entryways contribute to the perception of human activity beyond the street, while those with blank walls and garages suggest that people are far away."* (Jacobs, 1993)

In urban planning, coherence refers to a sensitivity to the visual directive or the systematic preparation of physical things in the atmosphere. Coherence is the constancy and complementarity of the building components of a cooperative form in scale (grain) and setting close interaction (Alexander et al., 1977) and (Ewing et al. 2006). Coherence in architecture is as, *"buildings on the best streets will get along with each other"* (Jacobs, 1993).

Linkage is an urban design word that refers to the lines that link different components of the urban environment. In essence, it is the design of a spatial datum that encompasses the *"flow of movement, and organizational axis, or a building edge"* (Trancik, 1986). *"The continuous tree rows can psychologically connect places at either end, and tree patterns that reflect or amplify building geometry can psychologically link buildings to the street."* (Arnold, 1993) The visual richness of a location is determined by its complexity. It has been related to changes in texture, width, height, and setback of Buildings (Elsheshtawy 1997). Complexity has been related to building shapes, articulation, and ornamentation (Stamps, 1999; Heath et al., 2000).

RESEARCH METHODOLOGY

The conceptual framework shows how walkability relates to physical features, urban design qualities, and user reaction. Both qualitative and quantitative methods were adopted to conduct the research. At first, a comprehensive visual assessment of urban streets is conducted to determine urban design qualities.

Identifying the qualities of urban design

In the literature on urban design, several qualities have been described that influence the walking behaviour in the street. In addition, visual assessment literature also added numerous quality insights which help perceive the environment of an individual. The quality of visual assessment crosses the boundary of urban design to another field of study including landscape and planning as well. However, all qualities from visual assessment literature and urban design literature are not well connected to a walkability study. In 2009, Ewing and Handy narrowed the range down from 51 qualities to 8 qualities: enclosure, legibility, human scale, transparency, complexity, coherence, linkage, and imageability.

Preparing a sample of users

The target of the study is to conduct a visual assessment where users can rate the urban design quality of the street and also measure their reactions. Since the definition or description of the quality of urban design are not well known to an average person and it is quite difficult for a random user to rate legibility, imageability, and other qualities without having any knowledge of urban design or a related subject. So, a group of undergraduate students from architecture school was selected as respondents who already completed an urban design course and terms such as urban design qualities and other design principles are well known to them. As local students, they already spent four to five years in the Sylhet city and are experienced with the morphology of the case study area. However, a visual scenario was provided by capturing photographs of the street. There were about 60 students (35 male and 25 female) who participated in the rating.

Preparing sample pictures for visual assessment

This is necessary to provide a clear scene of the case study area in front of the users during rating. Firstly, the study areas are divided into 12 segments so that every piece of information in street can be captured through photographs. The photographs are taken at similar distances, maintaining equal height so the vista or scale of the street remains unchanged. In addition, a video of the overall site was also collected for live documentation, activity, and the environment of the location. Multi-layer mapping of the case study area has been drawn on several urban design issues within the street to understand the urban design quality for the user perception.

Measurement of urban design qualities (questionnaire survey)

Firstly, the visual assessment is conducted by an online self-administrative questionnaire survey. There are three major parts of the questionnaire survey—demographic data, the evolution of urban design quality, and respondent reactions such as safety, comfort, and level of interest in walkability within Zindabazar Street. Five scale measurements of the Likert scale ranging from 'strongly disagree' (value 1) to 'strongly agree' (value 5) are defined to regulate the urban design quality of the street by the respondent. Eight urban design qualities have been preferred based on the previous study—imageability, legibility,

enclosure, human scale, linkage, coherence, complexity, and transparency. For instance, the respondent was asked *"How do you rate the imageability of Zindabazar Street?"* Here, they had to rate it on a five-point measure of the Likert scale where value 1 defines that the character "imageability" strongly exists in Zindabazar Street whereas value 5 denotes that imageability is not apparent at all. Respondents were accountable to fill up the questionnaire form by using photographs, mapping, and several video scenes. However, respondents are also in control to rate the reaction on comfort, safety, and preferences of walkability in Zindabazar Street ranging from the 'least preferred' (value 1) to 'most preferred' (value 7).

Data analysis

The research performed a statistical model to identify the relationship between the urban design quality and people's overall preference for walkability. It is assumed that user preference for walking is dependent on urban design qualities. Hence here, walking preference is a dependent variable whereas design qualities are independent. Walking preference may be associated with multiple factors so multiple regression model has been used to analyse data. Multiple regression models are represented by: yi = a + b1x1 + b2x2 + … + bixi + ei, where yi represents the dependent variable, xi is the independent variable, a is the y-intercept or constant, it is considered the residual prediction error, b1 is the partial regression coefficient on x1, similarly, b2 is on x2. In addition, the models are used to understand the relation between urban design qualities and people's comfort, security, and overall preferences in the urban street.

RESULTS

Experience and walking culture of Zindabazar Street

Since Zindabazar is the major business centre and retail hub of the city, many people move through the street every day (Fig. 6). Current pedestrian capacity is inadequate compared to its human traffic flow therefore people often like to walk in the vehicular street (Fig. 7), although the city authority has recently widened the pedestrian way, decorated the sidewall and removed street vendors (Fig. 8). According to users, walkers use the street for their daily needs rather than their preferences. Being a major business street, most people move because of their daily job. In addition, this street is the connector between the north and south parts of the city, therefore heavy human traffic passes the street every day. In Sylhet, people depend on vehicles rather than walking to cover short distances due to adequate walkways, safety for children and women, and universal accessibility which consequently cause massive traffic congestion.

In Zindabazar, several restaurants, retail outlets, shopping malls, education institutes, and public buildings generate tremendous pressure on pedestrians. Since there are no comprehensive building code and guidelines that results in massive public buildings with minimum set back from the street. Therefore, buildings' overcrowding often spreads to the pedestrian ways; even sometimes roadside shops overflow the pedestrian and hinder the walkability (Fig 9). Small-scale open platforms or plazas in front of public buildings and shopping malls could resolve the pressure on the street. High land value is another reason that prompts the maximization of the use of land.

Excessive privatization in the Zindabazar area impedes the street development process initiated by the city authority. It is easier to redevelop or redesign any public space rather than private space due to ownership complexity. Though the city authority has developed road side walls for government institutions and other public spaces they hardly can design other private spaces. Therefore, a comprehensive street design always remains incomplete. It is important to have a quality walk to percept the context in mind and memory. Quality walking is necessary to socialize with others and benefit individual health. Zindabazar Street is one of the key points of interest for locals and tourists. It also accommodates some major public facility buildings and spaces. But due to unplanned development, the street can hardly offer social and recreational benefits to the passer-by.

Fig. 7. People walking on the vehicular street. (Source: authors)

Fig. 8. Decorative road side wall developed by city authority. (Source: authors)

Fig. 9. Shops overflow on the pedestrian way. (Source: authors)

Urban design qualities analysis

The survey identifies that the user preference to walk in the street is not satisfactory. The mean score for walking preference is 3.88 on a scale of 7. Although the preference level is lower, the crowd of pedestrians might have resulted from the need and daily jobs. In addition, as a mixed land use zone, the area invites masses of people for different causes. This research identified that the urban design quality of Zindabazar Street is not potent enough to describe since the mean score of most of the qualities is below 3.5 where the score is measured on a Likert scale from one to five. Two of eight qualities have scored above 3.5 and they are imageability and complexity while other qualities like linkage, enclosure, human scale, legibility, and complexity have scored less than 3.5. The results shows that not all the urban design qualities are significantly associated with walking preference in Zindabazar Street. Only legibility, human scale, and transparency are significant while other qualities are not statically significant. The results shows the P value of legibility, human scale, and transparency is less than .05 which means these qualities are statically significant for walking preference and can be identified, while the P value of the rest of the qualities is more than (.05) (see Tab. 2).

The research also identified the correlation of each urban design quality with user preferences to understand the significance of each quality. The results shows that legibility and transparency significantly correlate with user preferences (p <.05) (see Tab. 3). It seems that other qualities where the p-value is too high, are not sufficiently considered for preference of walking in Zindabazar Street. On the other hand, physical features that improve those qualities are significantly missing. According to the concept of Ewing and Handy, individual reaction is also important and holds a criterion for walkability. The research attempted to understand the relation between user safety, user comfort, and user preference. The results shows that (Tab. 4) user preference is highly dependent on user safety and comfort. Here the "p" value for both user safety and comfort is less than (.02) (see Tab. 4). It means the user feels the safety and comfort of walking in Zindabazar are highly recommended.

Tab. 2. Correlation between urban design qualities and people's preferences for walking. (Source: authors)

Multiple R	0.544
R Square	0.296
Adjusted R Square	0.156
Standard Error	1.037
Observations	49.000

	Coefficients	Standard Error	t Stat	P-Value
Intercept	3.010	1.424	2.11	0.041
Imageability	0.018	0.224	0.07	0.937
Legibility	0.409	0.198	2.06	0.045
Human Scale	0.417	0.167	2.50	0.016
Transparency	-0.404	0.174	-2.32	0.025
Complexity	-0.007	0.149	-0.05	0.961
Coherence	0.024	0.149	0.16	0.871
Linkage	-0.152	0.173	-0.87	0.385
Enclosure	-0.102	0.181	-0.56	0.578

Dependent variables: users' overall preferences. Independent variables: urban design qualities.

Tab. 3. Correlation between urban design qualities, transparency, and legibility. (Source: authors)

	df	SS	MS	F	Significance F
Regression	1.0	5.0	5.0	4.2	0.04
Residual	48.0	56.2	1.1		
Total	49.0	61.2	6.1		

Dependent variable: users' overall preferences. Predictor: legibility.

	df	SS	MS	F	Significance F
Regression	1.0	4.05	4.05	4.80	0.03
Residual	48.0	40.53	0.84		
Total	49.0	44.58			

Dependent variable: user preference. Predictor: transparency.

Tab. 4. The relation between urban design qualities and user safety. (Source: authors)

Multiple R	0.71
R Square	0.51
Adjusted R Square	0.49
Standard Error	0.80
Observations	49.00

	Coefficients	Standard Error	t Stat	P-Value
Intercept	0.93	0.41	2.26	0.02
User Safety	0.33	0.13	2.49	0.01
User Comfort	0.72	0.15	4.70	0.00

Dependent variable: users' overall preferences. Predictor: safety and comfort.

The research has identified the impact of urban design qualities on user safety and comfort. The results shows that no quality has a potential effect on user safety and comfort. For user safety, from among eight qualities (see Tab. 2) only linkage is significant (p >.05) when it individually co-relates with user safety. Here user safety is considered a dependent variable.

Tab. 5. Relation between user preferences, comfort, and safety. (Source: authors)

Multiple R	0.47
R Square	0.22
Adjusted R Square	0.07
Standard Error	0.92
Observations	50.00

	Coefficients	Standard Error	t Stat	P-Value
Intercept	1.61	1.24	1.30	0.20
Imageability	-0.18	0.19	-0.92	0.36
Legibility	0.18	0.17	1.04	0.30
Human Scale	0.19	0.15	1.26	0.21
Transparency	-0.28	0.15	-1.84	0.07
Complexity	0.16	0.13	1.20	0.24
Coherence	0.12	0.13	0.90	0.37
Linkage	0.28	0.14	1.91	0.06
Enclosure	-0.08	0.16	-0.51	0.61

ANOVA

	df	SS	MS	F	Significance F
Regression	1.00	4.05	4.05	4.80	0.03
Residual	48.00	40.53	0.84		
Total	49.00	44.58			

DISCUSSION AND CONCLUSION

The results of the research determines an idea on the urban design qualities of Zindabazar Street and the relation of these qualities with user preferences. Urban design qualities are not significant to stimulate the walking for pedestrians. It seems most of the people use this street for daily jobs and needs. As a major street of the city and commercial hub, it welcomes masses of people all day long. Though the Sylhet City Corporation has initiated some interventions such as widening roads, road dividers, and pedestrian improvements, these physical changes had little effect on the urban design qualities. The results proved that three qualities i.e. legibility, transparency, and human scale are significant. This research found five qualities among eight that have no significance on user preference on walking on Zindabazar Street. If imageability is a concern, the street has no physical element which can be identified with it for memorization for a long time within this area. The physical elements and design motivate urban design qualities which are perceptual, although there are differences in perception conditioned by age, sex, and other social impacts of the human being. Here, urban design qualities are examined as the variable for user safety and comfort. The results shows that there is no sign of the qualities of the two variables. It appears that user safety and comfort mostly depend on the physical quality and management of the street.

The research found a significant gap in street management, design, and building regulation guideline. Excessive privatization of land is another hindrance to the improvement of the pedestrian ways. A long-term vision can be generated to develop the street by ensuring building guidelines, street facilities, and street management. The vision should be aligned to the urban design qualities. Government can take initiative to make a policy by a public-private partnership to intervene in more quality facilities and environment in Zindabazar Street. In addition, open spaces, old heritage buildings, landmarks, and monuments can be connected visually or physically to improve imageability. Several internal connections can be drawn to increase linkage. Multilevel connection and vehicular free access can be developed. For better transparency, the street should be vendor-free and the street furniture needs to be improved. Although the human scale and enclosure depend on the individual perception, apart from pedestrian ways, the street needs a clear vista from starting to an endpoint and some pocket space with street furniture to relax or stay for a while. Vegetation, pedestrian material, street furniture, and barrier-free visual access can stimulate users to walk in Zindabazar. As a public space, the street is an important element of the city where people can explore urban aesthetic, cultural, and social benefits. Urban design qualities can add more dynamic to city aesthetics and influence walkability.

Acknowledgments

My cordial thanks and gratitude to the co-authors of this paper Dr. Md Mustafizur Rahman and Tanjima Siddika for their support, especially in conducting the survey and data analysis. I am grateful to the research centre of Shahjalal University of Science and Technology in Sylhet, Bangladesh, which financially supported the project related to this paper.

References

Alexander, C., Ishikawa, S., Silverstein, M. (1977) "A Pattern Language: Towns, Buildings, Construction", Oxford University Press, New York, USA.

Arnold, H. (1993) "Trees in Urban Design", Van Nostrand Reinhold. New York, USA.

Carmona, M., de Magalhães, C. Hammond, L. (2021) "5.6 Public Space: The Management Dimension", In: Public Space Reader, Routledge, Taylor & Francis, New York, USA.

Duany, A., Plater-Zyberk, E. (1992) "The second coming of the American small town", Wilson Quarterly, Vol. 16(1), pp. 3-51.

Eichner, R., Tobey, H. (1987) "Public Streets for Public Use", Van Nostrand Reinhold Company Inc., New York, USA.

Elsheshtawy, Y. (1997) "Urban complexity: toward the measurement of the physical complexity of streetscapes", Journal of Architectural and Planning Research, Vol. 14(4), pp. 301-316, Locke Science Publishing Company, Inc.

Engwicht, D. (1999) "Street reclaiming: creating livable streets and vibrant communities", New Society Publishers Gabriola Island, Canada.

Ernawati, J., Surjono, Sudarmo, B.S. (2018) "People's preferences of urban design qualities for walking on a commercial street", In: IOP Conference Series: Earth and Environmental Science, Vol. 126(1), p. 1-9. IOP Publishing. https://doi.org/10.1088/1755-1315/126/1/012206

Ewing, R., Handy, S. (2009) "Measuring the unmeasurable: Urban design qualities related to walkability", Journal of Urban design, Vol. 14(1), pp. 65-84. https://doi.org/10.1080/13574800802451155

Ewing, R., Handy, S., Brownson, R.C., Clemente, O., Winston, E. (2006) "Identifying and measuring urban design qualities related to walkability", Journal of Physical Activity and Health Vol. 3(1), pp. 223-240. https://doi.org/10.1123/jpah.3.s1.s223

Gehl, J. (1987) "Life between buildings", Van Nostrand Reinhold, New York, USA.

Heath, T., Smith, S., Lim, B. (2000) "The complexity of tall building facades", Journal of Architectural and Planning Research, Vol. 17(3), pp. 206-220.

Hedman, R., Jaszewski, A. (1984) "Fundamentals of urban design", Routledge, Taylor & Francis, New York, USA.

Jacobs, A.B. (1993) "Great Streets", MIT Press, Cambridge, USA.

Jacobs, J. (1961) "The Death and Life of Great American Cities", 1st ed., Modern Library, New York, USA.

Jacobs, J. (2016) "The death and life of great American cities", Vintage Books, New York, USA.

Lynch, K. (1960) "The image of the city", MIT Press, Cambridge, USA.

Obeidy, M., Shamsuddin, S. (2017) "The role of commercial streets as a channel of movement in relating to the sense of place", International Journal of advanced Research (IJAR), Vol. 5(1), pp. 1598-1607. http://dx.doi.o-g/10.21474/UAR01/2925

Oranratmanee, R., Sachakul, V. (2014) "Streets as public spaces in Southeast Asia: Case studies of Thai pedestrian streets", Journal of Urban Design, Vol. 19(2), pp. 211-229. https://doi.org/10.1080/13574809.2013.870465

Polívka, J., Reicher, C. (2019) "The Role of Transparency in Urban Planning

Processes", In: Berger, S., Owetschkin, D. (eds) Contested Transparencies, Social Movements and the Public Sphere, pp. 233-251. Palgrave Macmillan, Cham, Great Britain. https://doi.org/10.1007/978-3-030-23949-7_11

Purciel, M., Marrone, E. (2006) "Observational validation of urban design measures for New York City: Field manual", Active Living Research Program, Robert Wood Johnson Foundation.

Sammas, Y.A.A. (2008) "The Role of Active Public Streets as Prerequisite for Liveable Cities", Master thesis, Universiti Teknologi Malaysia.

Sholihah, A.B. (2005) "The role of informal street activities in the context of conserving urban cultural entity : case study : Malioboro Street, Yogyakarta Indonesia", Master thesis, Universiti Teknologi Malaysia

Stamps III, A.E. (1999) "Sex, complexity, and preferences for residential facades", Perceptual and motor skills, Vol. 88(3_suppl), pp. 1301-1312. https://doi.org/10.2466/pms.1999.88.3c.1301

Telford, T. (2007) "Manual for Streets", Thomas Telford Ltd., London, Great Britain.

Trancik, R. (1986) "Finding Lost Space: Theories of Urban Design", Van Nostrand Reinhold Company, New York, USA.

Woolley, H. (2003) "Urban Open Spaces", Taylor & Francis, London, Great Britain. https://doi.org/10.4324/9780203402146