

A Review of Effective Factors of Urban Design with an Emphasis on Pedestrian Movement

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ABSTRACT

In the past, cities were more walkable and walking was the main pattern of people movement in urban area because of low-cost and easy availability for all segments of the society. After industrial revolution and car domination in cities, pedestrian issues have been forgotten. In the last few decades, due to increase in air Pollution, Policy to reduce private vehicles use and policy to decrease fossil-fuel consumption, walking in urban areas has been considered again. The purpose of this paper is to examine and understand the walkability issue in urban area based on global experiences. It is achieved by investigating the functional role of street as the main element of urban area to present different perspectives on how to use the layout of streets in the world. Moreover, effective criteria to improve walkability are briefly explained and then categorized. In addition, some indicators are offered for assessing the walkability in the city to engage more people in the urban areas.

KEY WORDS: urban space, street, pedestrian movement, pedestrian, safety

1. INTRODUCTION

A review of relevant literature shows that according to various ideologies, urban theoreticians do not have any agreement about how to use urban spaces, especially Street. These different ideologies cause cars domination in cities for the past half century. It makes major problem such as traffic volume or “Traffic Madness” or “street anger” and causes pollution and unsafely in cities, and so urban life has been affected [1]. Therefore, the subject of humanistic city by increasing walkability and reconsidering the proportion of pedestrian in the transportation system has been taken into account by planner and urban designer. As a result, in some cities have been attempted to develop a comprehensive plan for pedestrian which its main objectives were: improving the quality of life, enhancement of accessibility and movement, ease to choose the path of travel, improved air quality, the equal usage right of the environment for all users, proper connection between land use and transportation system, investment and returns, health, safety and environmental sustainability. First, this article provides an introduction about theoretical and operational perspectives of public spaces, especially street as one of the key elements of urban, from 1) experts, users and service providers’ point of view, 2) the functionality of street as a public space, 3) pedestrian movement and the role of pedestrian in the current transportation system, 4) the effective viewpoints of urban design on the movement, 5) recognition and classification of impressive parameters on pedestrian movement according to the pedestrian comprehensive plan in some American and European cities. Second, in order to increase the quality of the physical environment, the goals, requirements and common criteria are compared in studied cities, and with regarding to social and cultural factors, some indicators are proposed to assess walkability.

What is the Problem? Street is considered as one of the key elements of urban space. Street act as a place for people interaction, recreation, walking, leisure, playing, shopping, window shopping, gathering, meetings, accessibility, movement, advertising, information and etc. public spaces such as streets have various functions in different communities over the history due to transportation development and according to the different behavioral and cultural pattern of pedestrian, gender and age, climate, ... etc., moreover, the rapid growth of cities and their suburbs, and using the private car as a main vehicle, especially due to lack of public transport caused changing in urban spaces.

As a result, there is no easy and safe movement for people, especially children and elderly and also people who have no private car. Pedestrian priority in the use of public space is threatened by variety of motor vehicles, and pedestrian is ignored; this is the fact that is indicated by fieldworks. On the other hand, because walking is one of the first inherent activities few months after birth, and its style has not changed since the beginning the human history, and its necessity has not decreased, Municipal Administration must facilitate easy movement for pedestrian. Pedestrian movement in public space needs appropriate space such as the road walk that should provide enjoyment, safety, comfort, attractive environment, accessibility and convenience for users. However, unfortunately, due to lack of research about Pedestrian movement caused by many barriers, the current urbanization is faced with a new challenge.

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According to new issues in the modern urbanism such as livable city, walkable city, health city and sustainable city, urban managements try to have a new look on movement with regarding to priority of walkability for designing urban spaces. Numerous documents of American and European cities that have been introduced as the comprehensive pedestrian plan, lead to government policies to encourage people to walk and create walkable city. Therefore, in this article try to answer follow questions:

- How can we make cities safe and attractiveness for pedestrian?
- What indicators should be considered to achieve balancing to a pedestrian oriented city?

2. METHOD AND RESEARCH PROCESS

The theoretical framework of this research starts with an overview of the relevant literature and surveys various perspectives on how to use public spaces, especially streets and pedestrian path. Moreover, comprehensive pedestrian plan of American and European cities has been studied to establish a logical connection between the criteria. Then these criteria are classified into two categories, physical and cultural-social. Finally, the urban spaces (used by pedestrian) are evaluated by identification indicators associated with each criterion, and classification of them. The evaluation can determine the value of each indicator and the role of them in increasing walkability in urban area.

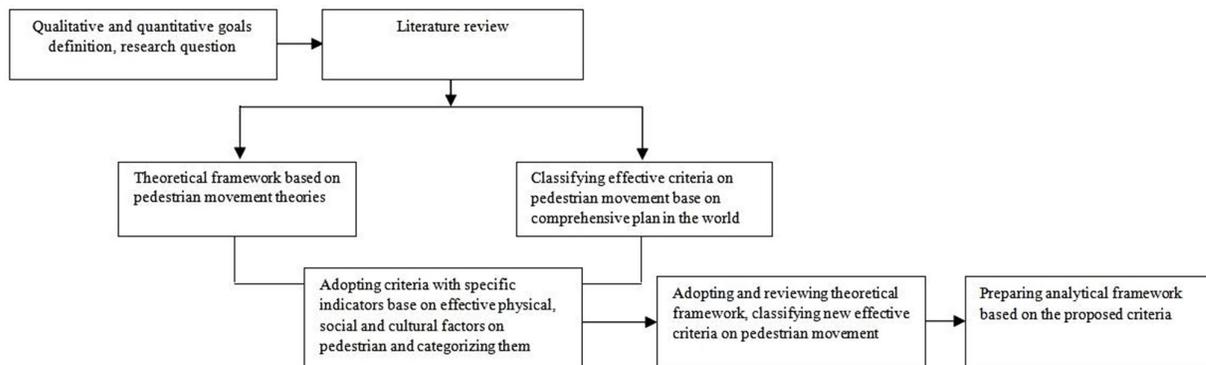


Figure 1 the research process

3. STREET PERFORMANCE AS A PROMINENT ELEMENT IN THE HISTORY OF URBAN SPACES

Whatever comes to mind from the word of “street” at the first time is its major function in movement as a thoroughfare. While, the street is one of the important elements of shaping urban form, symbol of culture and society, connection of spatial relationship and binding urban activity. The current cities have inherited streets as the great legacy from centuries ago and people always use urban spaces for movement, shopping, entertainment, watching, leisure, talking, sitting, sleeping, gathering and eating. Presence of the people effects on the street and makes it pleasant and lively. While, streets separate urban spaces from each other but they are most important component for connection and continuity and consistency of them, and also streets are considered as the area to strengthen the relationship between humans and urban environments [2].

In terms of street function, as Turner says in his book "The City as Landscape": “Wide, straight streets have been designed by dictators. They placed their palace and court at the lead of streets for the parade that was done to show the greatness and the space of this streets difference with recreational space which encompasses healthy environmental and entertainment issues.”[3]

The street has always been regarded as one of the key elements of urban spaces that involve traveling with comfort and safety, and its main role is accessibility; therefore, in recent years has been tried to separate pedestrian zone and car from each other [4]. While according to socio-historical ‘s point of view, streets and their composition are the reflection of community that makes them; according to William Whyte, people vote the path through the choosing comfort and accessible path for walking. Street has passed through the different period of time, from the ancient times until Contemporary era. Different period includes medieval, renaissance, enlightenment, industrial revolution and new age, which had different characteristics [4]. Table 1 shows these differences.

Table 1: The function of streets

Period	The function of streets and pathways
ancient times	First separator of pedestrians and cars, Increasing the width of streets and thoroughfares, The opulent streets, Decorate the main street by a row of columns, Located a set of columns at the intersection as the landscape, Construction of buildings on both sides of the street according to specified rules, heights and shapes, Determination different types of streets and roads, Pathway used by pedestrians, Pathway with capacity of through a gear, Pathway with capacity of through two gears together, The maximum width of the main thoroughfares 5/4 m and In other passages, maximum width 9/2 m for have balconies in houses on the upper floors
Medieval	Narrow streets and covered by arches and balconies of the upper floors, Temporary decorate the streets for religious ceremonies, Create pedestrian sidewalks as Special Protection, Create porch for pedestrians in order to protect from atmosphere that was suitable for both functional and aesthetic
Renaissance (back to ancient traditions)	The streets are very narrow and without sidewalks, Mostly private streets and some of them are occasionally opened to the people or added to public streets
enlightenment	Build the alleys and gardens
Industrial Revolution	Gardens built at the intersection of streets as places to meet and make contact, The emergence of the modern streets, Expand sidewalks, Numbered streets
New age	Lack of adequate protection for pedestrians on sidewalks due to the increased number of cars and congestion, Classify the types of routes: highway, boulevard, street crossings, dead-ends and dormitory, Differentiation pathways and spaces dedicated to public service and landscaping, Separate pedestrians from cars because the zoning With four applications: residential, employment, leisure and pathway
Contemporary	Creation first dedicated pedestrian path, in France, at the first traffic plan

Evolution of the street has been different in the history. Approaches such as: view the authority of government and kudos to them, Decorate for use in religious ceremonies, to parades and Rattling, war and conflict and at the end movement and pedestrian transportation and recreation and meeting.

4. EFFECTIVE APPROACHES FOR STREET DESIGN

Industrial Revolution, growth of urbanization, creation of new towns as well as the increase in automobile production and an inefficient public transport system, caused the private car became the only appropriate vehicle for movement. It made the problems such as traffic congestion and environmental pollution. In the conflict between the appropriate use by different groups, pedestrians and car, surely the main losers are pedestrians, especially children, the elderly and the disabled. In recent years, there are two major theories on motor vehicle traffic and pedestrian movement. One of them is car oriented cities, and another is pedestrian oriented cities. While each method has some advantages and disadvantages, but the global approach is more demanding the humanistic cities. Countries such as Germany and Netherlands in the late 1960s and early 1970s started a wide range of activities in this field. Advantages and disadvantages of each of the above methods are given in Table 2. Studying approaches that mentioned above and analyzing their benefit and defects show that walkability as the most basic and cheapest type of movement has been raised since creation of the human. Walkability can be the safest and most pleasant move for short distances and has a special place in the transportation system. On the other hand, studies have shown that people walk to one of the following purposes:

- Arriving work, shopping or public activity
- Outing and enjoy the urban environment
- A combination of the above two cases

And a number of physical, social and cultural factors, such as safety, security, convenience, time, place and climate, cost and barriers (like physical, visualization, culture, social and human), Physical condition of the pedestrian and attractiveness of route, influence on pedestrian movement. According to research about reasons for the presence of pedestrians in urban environment by Jan Gehl, environmental quality is an important issue, and he classified people activities in public spaces into the following three groups which each one needs special characteristics of the physical environment (Figure 2).

- Necessary activity : Concentration and daily activities of people like going to school, work and shopping that most of them are by walking and because they are done in any condition, physical environment and public spaces have minimal impact on them.

- Optional activities: if the environmental conditions are satisfactory, people encourage to do the activity such as walking for recreation and enjoyment of the environment, and if the quality of environment is not good, people just do the necessary activities. However, perhaps people prefer walking rather than fast movement with car.
- Resultant activities: It often occurs spontaneously and requires the presence of people on the public space like children playing, Passive popular contacts or meetings with other and etc. Enhancing environmental quality causes increasing feasibility of people meeting and their participation as the pedestrian in this activity.

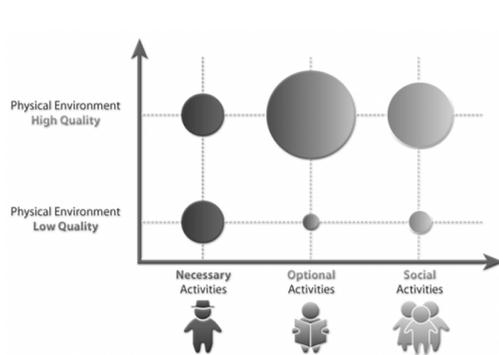


Figure 2. The effect of environmental quality on pedestrian activity. Source [5]

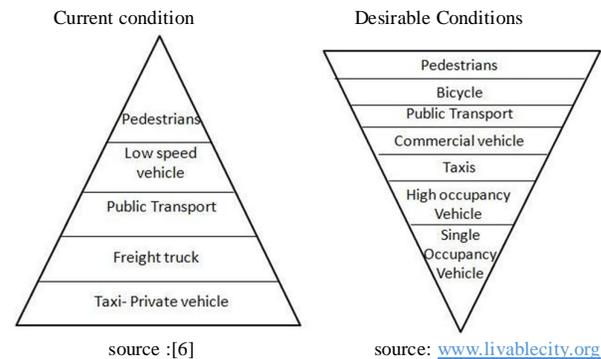


Figure 3. The portion of pedestrian in transportation system

This graph indicates the presence or absence of people based on physical activity in poor or good (high or low) quality of physical environment [5]. According to South worth, the environmental quality of pedestrian is the key of encouraging people to choose walking instead of using the car [7].

Table 2. Comparing different effective point of view on urban design (movement) Based on a review of relevant literature

Viewpoint	Advantage	Disadvantage
<p>Car-oriented city</p> <p>Definition of car –oriented cities: Automobile imposed its Scale on urban design and it requires a lot of space for movement and stop. So pedestrian is isolated in a limited and narrow walking space (That becomes steadily narrower). In this system Traffic function, mobility, flow, safety and cost are worth [6].</p>	<p>Increased personal mobility increasing speed of mobility and transport Saving time No restrictions on speed No restrictions on distance</p>	<p>Ignoring pedestrian safety and failure pedestrian to prioritize in traffic, Devoted little space to pedestrians Congestion, accidents, and increased mortality caused by accident, Environmental pollution and waste of fossil energy, Destruction of public spaces and cities and isolated neighborhoods, Lake of action in activity and performance of the urban economy, Reducing pedestrian activity and social interaction, people isolation in a confined space and reduced adaptation to the environment, Lake of time, Getting to car and reduce flexibility in movement, Increased signs and traffic lights (chaotic urban landscape), Converted to residential streets to crossing street and reduced sense of place, Reducing health and increasing obesity, Unlimited size of the cities and formation the suburbs, Prevent human relationship with nature as the natural need</p>
<p>Car free zone</p> <p>Car traffic zone phrase is used for the range of urban spaces such as parks and public squares. But recently, this has been used to define a more specific concept and indicates some urban area that because of special architectural or historic commerce [8] entrance of cars have been banned and And priority is given to pedestrians and public transport points [9]</p>	<p>Considering pedestrian as one of element in movement system, Easy access for all, especially for pedestrians, The revival of urban centers, Trade control in city centers Construction sidewalk To compete with suburban shopping centers, Space for shopping and entertainment, increasing retails and variety of activities in safe, comfortable, valuable and protected environment with the sense of belonging for optimal use of energy, business associates, Increasing the average of time that people spend on urban spaces</p>	<p>Restriction mobility for the disabled and powerless Speed Limitation Distance restrictions on movement</p>

<p>Pedestrian –oriented (Balancing between car and pedestrians)</p> <p>Urban design is based on human scale. In this urban design point of view pedestrian is the largest portion as a participant in transportation. Thus the importance of walking and improving pedestrian path as one of the most important methods of movement is regulated in transport system.</p>	<p>Protection of compatible movement such as walking and cycling, Environmental sustainability, Logical segmentation of urban areas, Reduce air pollution, Reduction in accident, Preservation old and historical contexts that are not designed for vehicles transport and restoring them, Visual relationship with environment and enhance the sense of place and environment, Lake of action in activity and performance of the urban economy, Improving social interaction, Saving Energy, Reduce costs, The flexibility and fast self-regulation , Difference of pedestrian movement with the other movements (shopping, interaction, entertainment, sport) Improved leisure time</p>	<p>Speed Limit Distance restrictions on movement Limit the size of cities Movement limitation for people with disabilities</p>
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5. THE ROLE OF PEDESTRIAN IN TRANSPORTATION SYSTEM

Whereas, pedestrian path in public urban spaces is for pedestrian movement, it can strengthen citizens’ relationship. However, pedestrians often do not know their right, or they are denied their right because of inadequate facilities in pedestrian path and lack of education and awareness of the pedestrian movement’s low. So that the role of pedestrians in the transportation system are eliminated based on statistic results, car domination and other barriers. Pedestrian issue and its role are considered as a serious subject, especially after World War II and reconstruction of cities. The primary purpose of the pedestrian path issue was to reduce accidents. Afterward, urban pedestrian path was the positive response to the growing needs of the population in unsafe car traffic zone, children playing area and etc. Figure 2 shows the new thinking of pedestrian as the first element of movement that was on the agenda of urban designer and planner. This new thinking needs executive mechanisms and accurate planning to create a balance between cars and pedestrians in cities. In recent years, extensive researches on more presence of the people in public spaces have been done in Developed countries in order to encourage them to increase walkability. In this regard, the comprehensive pedestrian plans in U.S. and European cities can be addressed. It should be mentioned that in Asian and some developing countries, there is a lack of efficient transport systems. Appelyard in “streets can kill cities,” said Third World cities discouraged with the bitter experience of the America cities in the 60s, and explained from the social point of view; our streets are dead places, and the cars (that streets are built for them) are the cause of their death. Thus, widening the streets is more additional and unnecessary work. Now this fundamental question is asked: can Third World cities find a shortcut in the cycle of hope and despair about the car? In this paper, Comprehensive Pedestrian Plan has been investigated and an additionally considered criterion has been extracted. In order to measure the importance of each criterion some indicators have been proposed.

6. PEDESTRIAN PLAN

Since 1960s, comprehensive plans in the world were introduced to present a framework for providing realistic and effective policies for the physical development of cities. Comprehensive plans are the broad strategy of new city’s development for the next 10 to 20 years. While they addressed micro issue such as transportation, land use, construction’s rules and etc., but these plans have paid a little attention to the environmental quality, movement and pedestrian and urban landscape. In these plans have not been mentioned to function of the streets as urban spaces and the role of people and pedestrians as effective element in the Urban Space. But in recent years with the new approach in urbanism, a special document as a pedestrian comprehensive plan has been prepared in a number of cities in Europe and America. All of these plans have same goals, policies and criteria that finally with using these criteria; they can present common solutions for answering this question: How to design a city for pedestrians?

The goal of these plans is creating movement systems to increase transportation attractiveness such as walking, cycling, and to encourage the use of public transport and also to develop specific policies related to pedestrian movement. Some American and European cities have prepared the pedestrian master plans such as Visconcin, Merilan, Kamlops, New Jersey, London, Paris, Ottawa, Oakland, Denver, Portland, College Stations, Delaware, Madison, Santa Barbara and etc. At the first the purposes and common criteria of these master plans have redefined and then some indicator for measuring quality and quantity of criteria have been proposed.

The list of selected walkability criteria are shown in table 3, which were classified into 8 groups, used for analyzing and measuring walking attitudes. Factors such as the quality of construction, physical obstacles,

crossing designations, lighting levels, signage, and traffic calming devices, belong to 'safety'. The topography, pedestrian infrastructures, quality and quantity of street furniture, (such as street width, pavement width, and the presence of pavement buffers) are related to 'pleasantness and comfort' in walking that also support pedestrian safety. Hence in terms of traffic the compound indicator might be perceived as 'safe' or 'pleasant', and consequently influence people decision to walk. In other words, the presence of all these various variables is more significant in encouraging people to choose walking as transportation mode, compared to the case that only one of these elements are present.

Table 3. Classification criteria that are derived from the relevant literature and pedestrian comprehensive plan in Europe and America, and re-classified according to the proposed social and cultural indicators

Criterion	Definition	proposed indicators
Safety [10], [11], [12], [13], [14] and [15]	Reaching to the destination with safety and health Increasing the quality of the physical environment Opportunity to cross the street safely and minimize risks	Traffic condition Pavement structure Lighting
Pleasantness, attractiveness, amenity/aesthetic [10], [16], [17], [18], [12] and [19]	giving identity to the physical environment Giving priority to pedestrian movement Developing standards for pedestrian movement Planning to promote pedestrian safety and satisfaction Creating an attractive environment with urban furniture	Street furniture Climate Topography Physical barriers Pedestrian infrastructure
Choices of transportation [20], [21], [22] and [23]	Choosing the destination an transport mode with regarding facilities, cost and time, the choice of public or private transport, bicycle or walking Choose a healthy and cheap mode of transport for covering short distance to go to park, shopping, school...	Facilities Cost Time
Accessibility and mobility [10], [17], [24], [18], [12],[25], [26], [27] and [28]	Convenient and appropriate access for all users in all pedestrian path Adequate legibility of accesses Facility for Safe pedestrian movement to achieve the required services	Organics/Inorganics
Public health education [29]	Reduce the use of private motor vehicles Improving public health through education Encouraging walking and cycling Reducing pollution and reducing fossil energy consumption by encouraging people to walk	Pedestrian safety education Pedestrian crossing Encouraging people to walk The amount of pollution reducing the amount of fossil fuels reducing
Street connectivity [16], [30], [31], [23], [32], [33], [34]	connection of pedestrian path from starting place to destination connection of pedestrian path in short distance and the spaces that motor vehicles are not allowed to cross them facility, amenity	Rate of connectivity of pedestrian paths from source to destination
Link between land use and transportation, Access to transit stations [16], [35], [36], [13], [30], [26], [23] and [34]	Create different land use with access to jobs, services, housing and transportation Development of different functions in order to encourage people to walk short distances Development of different land use for the purpose of facilities usage by pedestrians if the other facilities has been provided for environmental amenity The importance of transit stations Appropriate linkage between neighborhood with the aim of increasing comfort and environmental quality Reducing the use of private cars Safe and proper access for approaching pedestrian to station	Density of mix use Rate of environmental desirability in view point of user diversity Level access to station Type of Access Distance to stations
Security [11] and [12]	crime levels, and general supervision such as neighborhood surveillance or police presence	Social/public supervision, Levels of crime

7. CONCLUSION

In this paper according to relevant literature and comprehensive pedestrian plan of some cities a number of physical and socio-cultural criteria for an ideal urban space for walking have been interdicted. Adapting of these criteria with the local index and culture of the people in movement lead to present indicators for walkability

assessing, this indicator help to increase the quality of the physical environment. Pedestrian role as one of the indicators of urban sustainability issue have been on the agenda of urban designer, planner and managers in American and European cities and providing pedestrian master plan have been confirmed it. This plan has caused increasing the quality of environment and encouraging walkability. So can be conclude the rate of increasing walkability in urban spaces has direct relationship with the safety and secure, pleasantness, environmental attractiveness, accessibility, connectivity, social and cultural issues, land use and transportation system.

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