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Development of Pedestrian Walkways Model for the City Nucleus of Bangkok, Thailand

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Abstract

The research of the Pedestrian Walkways Model for the City Nucleus of Bangkok presents a criteria for creating an infrastructure based on people's engagement in expressing their opinions and requirements for example, adequate pedestrian width, safety when walking on the sidewalk, the cleanliness of the pavement and shady environment. This research uses qualitative research, observation procedures, and collecting data from 400 sets of multiple choice questionnaires for documentary studies to analyze fundamental data. This study shows that people's needs can be divided into 3 groups: 1) The safety of pedestrians which concern on install a crossing signal for maximum safety, 2) The environment of pedestrians which concern on appropriate cleaning policy for pedestrian walkways, and 3) The comfort of pedestrians which concern on utilities should be maintained in a systematic manner. Even in most developing nations, typical pedestrian walkway designs and the concept of involvement in expressing attitudes and needs not only respond to demand use but may also maintain political stability.

Keywords : Pedestrian; Convenience; Safety; Environment of Pedestrian

Introduction

The smart city concept is used in the design of pedestrian zones in the world's largest cities. The components of a smart city include Smart Infrastructure, Green Building, Eco Mobility, Nature and Environment, Smart Economy, Smart Citizen & Community and Smart Government. In the Eco Mobility issue, there is the topic of walking ability. (Walkability) included [1]. According to Repko and DeBroux (2012) [2], the building of pedestrian zones cannot be separated from the integrative framework of the smart city concept. The presence of pedestrian zones on either side of the roadway exemplifies the tension between mobility and public space. The pedestrian zone represents the battle to integrate the functions of mobility, economic function (efficient and rapid), and socio-political, which can lead to contestation and negotiation [3-5], as well as the role of a transportation system extension.

The survey exposes a possible conflict between the government and the people, particularly street vendors, in emerging countries. Street vendors do not have access to pedestrian zones since they are not involved in the design of public spaces or the development of public policies [6-7]. Pedestrian zones function as public spaces in urban areas by encouraging trade, mobility, and social interaction [8-10]. As a result, people's involvement every person who used walking in attitudes and wants may be a notion worth considering.

According to Whyte (2000) [11], the party in charge of public spaces such as malls, plazas, and parks would be closely identified with conflict and negotiation between the government and the community. The problem has arisen as a result of a conflict over the functioning of these spaces. Ho Chi Minh (Vietnam) is an example of pedestrian zone monitoring (expanding its pedestrian friendly streets by creating continuous footways and in

addition a walking friendly downtown could be pursued to expand the pedestrianised Nygen Street), since it is heavily guarded by the city administration and its use ensures flexibility for pedestrians.

The public owns urban spaces, which catalyses social and cultural connections. The way we use space is defined by our behavioural patterns. As a result, a successful urban design is determined by how well it satisfies human values. Although the majority of accidents occur while walking on sidewalks and crossing streets to board or exit a bus [12], conflicts over the nature of and rights associated with public space have a long history in the United States.

The importance of working in urban planning and the problems that city pedestrians encounter have been established [13-14]. Accidents on pedestrian routes kill and injure many people, especially in underdeveloped countries [15-17]. Bangkok is a fast-expanding city with a linear distribution of mixed-use zones. A fine-scale land-use strategy is required to deal with the challenge of such a land-use mixture [18]. Natural gas and gasoline resources are wasted as a result of the heavy traffic during rush hour, and Bangkokians' stress levels rise.

Criteria for Pedestrian Walkways Model (PWM) to be prepared in this study which suitable for users, play an important role in the urban management plan in a city with a mix of land uses, such as Bangkok. The study's goal is to look at public life on Bangkok's pedestrian walkways with the notion that users' wants and satisfaction should be considered while designing pedestrian walkways which user need.

An ecology-culture-behaviour paradigm is offered to accurately justify the link between pedestrian path design. Bangkok pedestrian walkways users and their activities within the pedestrian walkways area are also observed and surveyed to provide an overall picture of the attitudes and expectations of the users in Bangkok's City Nucleus, Dust District (CNB). Then came the invention of the PWM.

Study Site

The research was carried out at the main crossroads in CNB. This is a particularly significant zone, since it contains the administrative hub of the monarchy, including the National Assembly, the Dusit Grand Palace, and various ministries. Ananta Samakhom Throne Hall, another former house of King Chulalongkorn and subsequently utilized as the first parliament building, is an important structure in the district. It was designed by Annibale Rigotti and Mario Tamagno, two Italian architects, between 1907 and 1915. The Amphion Sathan Residential Hall, the official house of the current monarch King Vajiralongkorn, is located next to the throne hall. We analysed Samsen Road from the Vajira Hospital intersection (A) to the Sri Ayutthaya Road intersection (B), a distance of 3.5 kilometres, and from the foot of the Krung Thon Bridge (C) to the Kan-Ruen junction (D), a distance of around 1.7 kilometres (Figure 1).

Material and Method

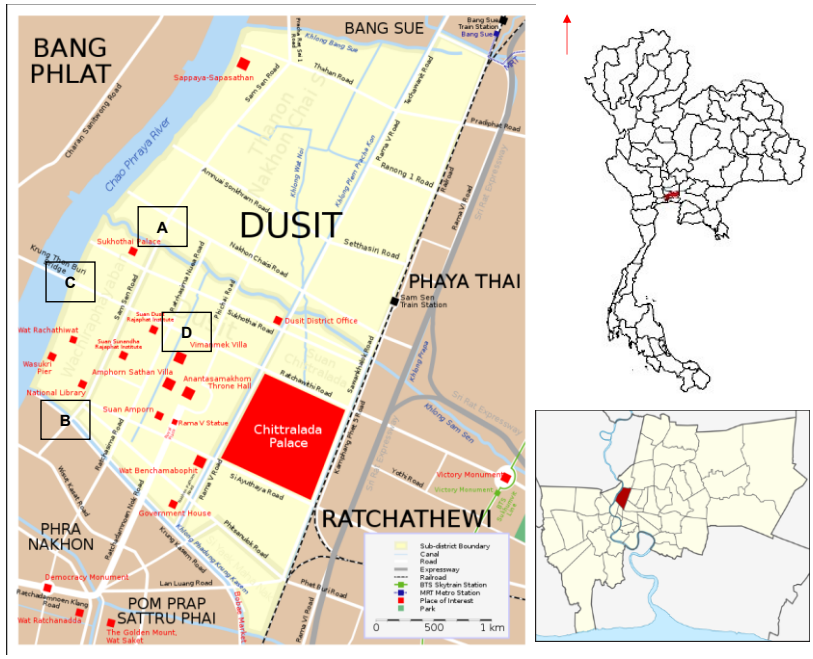
To create PWM in CNB, we followed the four procedures outlined below to locate eligible Bangkok Pedestrian Walkways.

Step 1: Field observation and preliminary information gathering. In this area have school, government office, public health service facility, and commercial buildings. The total distance is approximately 5.2 kilometers and takes approximately 2 months to explore (February – March 2021).

Step 2: Questionnaire and sample size. CNB population which totalled 83,897 people. A total of 394 people were randomly selected and sampled using the Taro Yamane table at the 0.95 statistically significant confidence level. We conducted a questionnaire study of 400 accidental samples from Bangkok's pedestrian users (BPU) to determine the views and requirements of the people who live in CNB and the BPU about improved pedestrian paths. (between February – March 2021). The reliability ratings for the attitudes and needs questionnaires were 0.85 and 0.89, respectively.

Step 3: Using descriptive statistics, analyse the data to summarize the major points acquired from the research findings of questionnaire surveys.

Step 4: Suggest an appropriate PWM based on the attitudes and demands of the people in CNB.



Source: Department of City Planning, Bangkok Metropolitan Administration, 2019

Figure 1 Study area around the city nucleus of Bangkok, Dusit District

Results

1. Field observation and preliminary information gathering

1.1 The physical of the pavement of CNB

As a consequence of the findings, we can conclude that there were three primary concerns at the research site:

1) Concerns about the ease of usage of the pedestrian walkways.

The pedestrian walkways in CNB are unusually narrow, with barriers such as police posts, power poles, overpasses, billboards, unused telephone boxes, and post boxes along the pedestrian route. BPU experience surface issues problems as well as a lack of shade from the sun and rain (Figure 2).

Figure 2 Nonstandard width pedestrian with obstacles and surface problems

2) Concerns about the safety of walking.

There are risks of pavement accidents, such as riding a motorcycle on the sidewalk, and difficulties walking at night, such as insufficient lighting at certain times. Crime hazards like poorly lit hallway corners and lonely alleyways may be the result of concealed crimes like homelessness or criminal gangs.

3) Concerns about the walking environment.

CNB has a congested retail setting between the sidewalks. There are several selling activities as well as autos, taxis, and bikers on the sidewalk. Solid trash contributes to an unpleasant physical environment that inhibits walking. Solid waste is to blame for the pollution around the pedestrians. This is owing to the presence of roadside food stalls (Figure 3).

Figure 3 The roadside food shop makes solid waste on the pedestrian of CNB

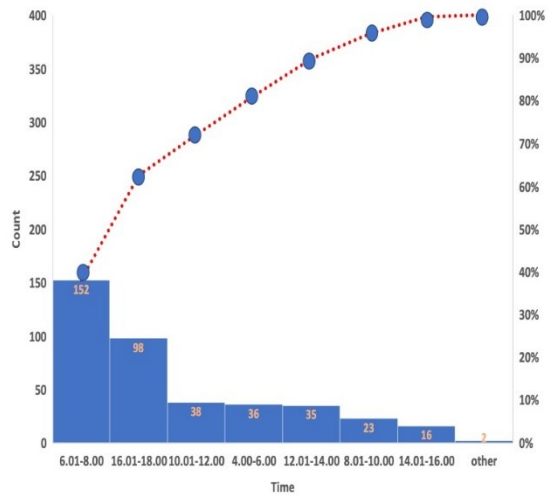
1.2 The pattern of use by the BPU

The assessment of 400 unintentional samples (Table 1) revealed that 152 BPP samples always utilize the pedestrian path early in the morning (06.01-08.00 am) for their everyday activities (Figure 4), while BPP takes between 10 and 30 minutes to complete on sidewalks in each day.

Figure 5 demonstrates that the majority of BPP utilize pedestrian paths within a 41-50 meter radius. Because of CNB's extremely hot and humid weather, Thai people walk differently than those from other nations. Most BPPs, however, require a pedestrian path for their daily travel to work.

Table 1 Base data of survey population

Base Data	Amount
1. Sex	
1.1 Male	162
1.2 Female	238
2. Domicile	
2.1 Bangkok	152
2.2 Provincial	248
3. Age	
3.1 <20 yrs.	41
3.2 20-30 yrs	197
3.3 31-40 yrs	98
3.4 41-40 yrs	51
3.5 51-60 yrs	13
3.6 >60yrs	-
4. Education	
4.1 Junior high school	13
4.2 Senior high school	32
4.3 Vocational Certificate	24
4.4 High Vocational Certificate	27
4.5 Bachelor's degree	286
4.6 > Bachelor's degree	18
5. Occupation	
5.1 Government service / state enterprise	6
5.2 Company employee	219
5.3 Own business	15
5.4 General employee	7
5.5 Student	152
5.6 Other	1



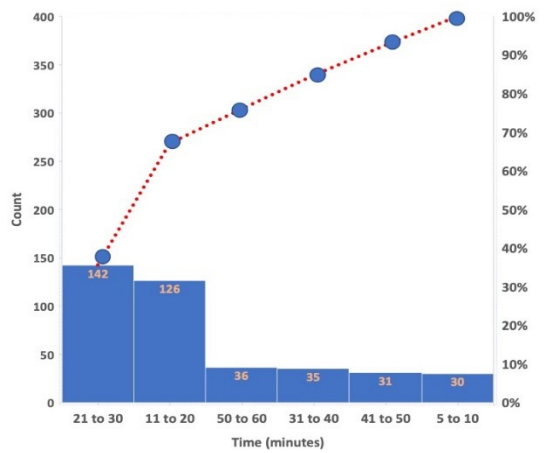
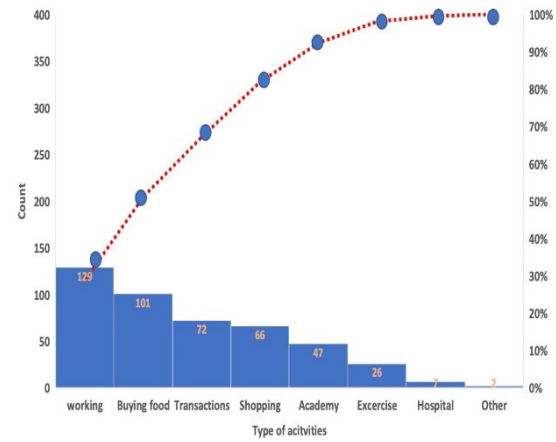


Figure 4 Pareto graphs of time interval and time used on a pedestrian walkway by BPU



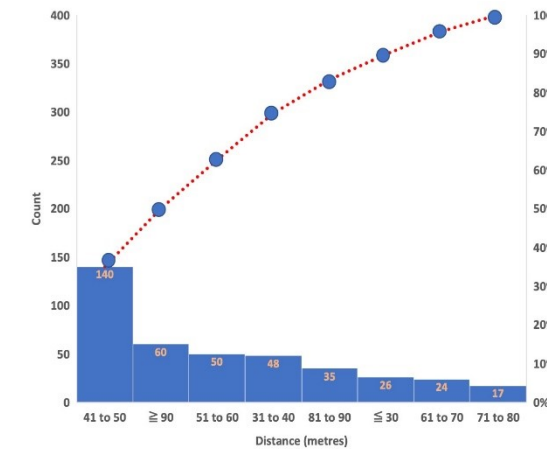


Figure 5 Pareto graphs of distance and type of activities at a pedestrian walkway by BPU

2. Attitudes and needs regarding the improvement of the pedestrian walkways

The questionnaire study revealed the attitudes and demands of the population dwelling in CNB and the BPP in three major areas: (1) by giving importance to the issue of install a crossing signal for maximum safety, (2) to improve appropriate cleaning policy for pedestrian walkways, and (3) utilities should be maintained in a systematic manner (Table 2).

3. The suitable PWM according to the attitudes and needs of the people in CNB

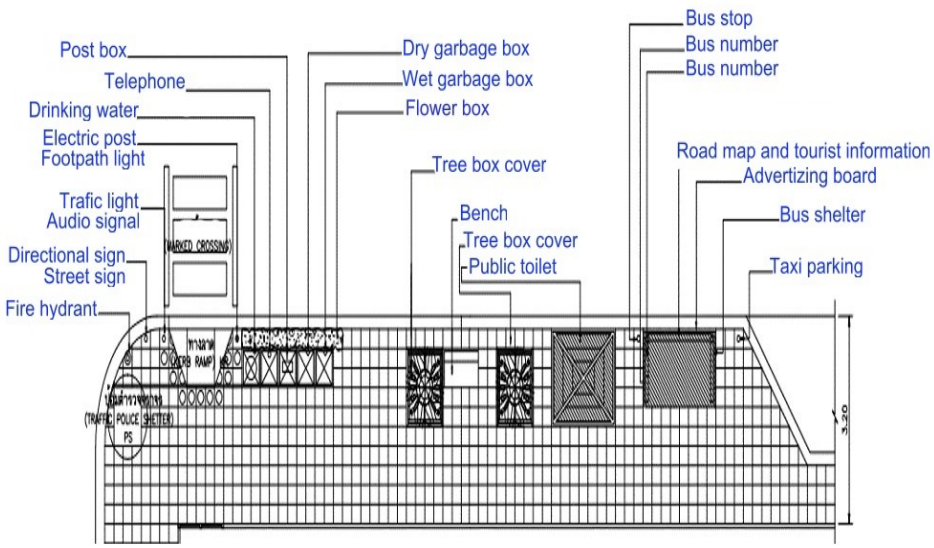
1) The Bangkok Metropolitan Administration always uses the standard pedestrian walkways design (Figure 6). However, the pavement design should be adjusted to suit that area of CNB.

The pedestrian walkways are designed to suit the context of each area. The design of the pedestrian walkway must concern the potential order of the road. The width of the lane, the number of people who use the pedestrian walkways, and the activity of pedestrian users by focusing on each target group. The pedestrian walkways design should be of high quality and contain advantages for the users in CNB.

2) In CNB, several pedestrian walkways are narrow (less than 1 meter wide), uneven, and broken. Many barriers, such as unused telephone booths, power poles, plant pots, billboards, footbridges, and pedestrian crossings, should be eliminated. The space should be flattened to maintain continuity, and large trees should not be planted in the restricted area.

Table 2 Attitudes and needs on the pedestrian walkways improving

Attitudes and needs	Mean	SD
1. The safety of pedestrians		
1.1 When constructing pedestrian pathways, crime prevention should be considered.	3.94	1.88
1.2 Illumination when walking in the dark.	4.33	2.15
1.3 Consideration must be given to pedestrian safety.	4.24	2.18
1.4 Width and slope are standard.	4.27	2.17
1.5 Preventing and resolving homeless problems.	4.21	2.15
1.6 Addressing the issue of insecurity caused by tangled cables.	4.32	2.20
1.7 Large trees on pedestrian paths can be uncomfortable and obstructive.	4.06	2.08
1.8 Sufficient equipment for comfort and safety.	4.30	2.18
1.9 Create a mechanism to address the issue of motorcyclists on pedestrian pathways.	4.36	2.21
1.10 Install a crossing signal for maximum safety.	**4.41**	2.22
2. The environment of pedestrians		
2.1 Appropriate cleaning policy for pedestrian walkways.	**4.27**	2.33
2.2 Strict rules for setting up a store on pedestrian pathways.	3.95	2.03
2.3 Stores are classified into zones.	4.06	2.07
2.4 Landscaping and gardening to maximize vistas.	4.03	2.05
2.5 System for solid waste management and stray dog control.	4.17	2.12
3. The comfort of pedestrians		
3.1 The pedestrian walkways' surface is not smooth.	4.17	2.13
3.2 There is a demand for pedestrian pathways that allow people to stroll freely and rapidly.	4.04	2.07
3.3 A sufficiently wide pedestrian path is required.	3.90	2.03
3.4 Shaded sidewalks with a roof cover surrounding pedestrian paths are required.	3.99	2.05
3.5 The pedestrian pathways must be extended.	4.14	2.11
3.6 Utilities should be maintained in a systematic manner.	**4.22**	2.16
3.7 Passenger lodging at the passenger pick-up location.	4.05	2.21
3.8 Disabled people's accessibility requirements.	4.07	2.20
3.9 The requirement for pedestrian traffic control.	4.09	2.19



Source: Department of City Planning, Bangkok Metropolitan Administration, 2019.

Figure 6 The standard pedestrian walkways design of Bangkok Metropolitan

3) In CNB, there are different activities on both sides of the road. As a result, the management strategy is critical for greater scenery and comfort.

4) Pedestrian pathways and renovations should employ high-quality materials and produce designs that are in keeping with the surrounding architecture's architectural style.

5) In congested areas, crosswalks with a width of at least 2 meters should be built instead of overpasses. To avoid accidents, traffic signs should be installed.

6) Only the required utility places should be aligned.

7) Huge trees should be cleared out of the path of pedestrian routes.

8) The relevant department must be inspected in accordance with the rules and regulations once the construction, renovations, and repairs are done.

9) Public participation should be encouraged in order to coordinate information to government agencies for safety.

According to the attitudes and needs of the people in CNB, we can make the suitable PWM by SCS (S-Safety, C-Comfortable, S-Scenery and Environment) as shown in Figure 7.

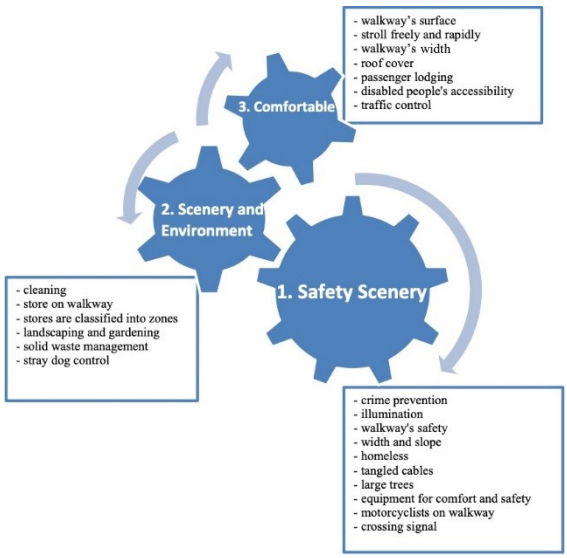


Figure 7 Pedestrian Walkways Model of SCS (S-Safety, C-Comfortable, S-Scenery)

Discussion

The management of walkways is a responsibility of the city so as to focus on assisting people who need to utilize them in order to live in the city in a harmonious manner [19-20]. It also promotes people to exercise and reduces the usage of private and public vehicles as well as the city's energy consumption. It also provides them with the possibility for social connection. According to the study, consumers choose a safe walkway as their first priority, followed by time for nice scenery, and an environment to walk in. Finally, people must be able to stroll comfortably. In Bangkok, there is a traffic congestion problem, particularly with motorcycles that use sidewalks instead of roadways, which have been reported to cause numerous accidents.

Furthermore, there may be limits in persuading urban inhabitants, particularly in Bangkok, to use more walkways, such as the hot climate and air pollution from vehicles on the street. As a result, the city must first address the issue of poor air quality. Pedestrian traffic, particularly during the COVID-19 outbreak, must include steps to limit sidewalk congestion for public safety.

This study can also show that human attitudes and needs are imperative to building utilities, which is consistent with research by Daniel M. Goldstein [21].

According to the evidence in this case study, if these changes are effective, they will result in more extensive regulation of public life and additional restrictions on the freedoms traditionally provided to citizen engagement in public areas.

Citizens' ability to communicate their thoughts and desires will increase governance security. According to Aminah [22], the smart city system's sidewalk transformation was a significant barrier for pedestrians because the transformation as a public site restricted citizens' accessibility [21-22]. These have provided the most efficient mechanism for each country to achieve their goal of administrative simplification in the City Nucleus while preserving appropriate pedestrian and vehicular access [23].

Conclusion

The creation of pedestrian walkways in CNB discovered that people desired the safest pedestrian path, install a crossing signal for maximum safety. The second is appropriate cleaning policy for pedestrian walkways, the third criterion need for development is utilities should be maintained in a systematic manner. However, Bangkok continues to have issues with air quality, particularly the PM-2.5 dust from the city's heavy traffic. As a result, it is one of the reasons why people of CNB avoid using the sidewalk for daily commuting.

Pavement building in Thailand is often done in accordance with standard pedestrian path designs. This study proposes the concept of using the Pedestrian Walkways Model of SCS (S-Safety, C-Comfortable, S-Scenery) to provide a realistic response. The standard pedestrian path designs do not address the needs of pedestrian users. Proposing the idea of developing pedestrian walkways by incorporating people's attitudes and need is thus a very important concept in the development of public utilities in metropolitan areas. Finally, the public will be able to participate in the construction of the pedestrian pattern based on the needs. It will be not only convenient but also beneficial to political stability.

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