

# IMPORTANT FACTORS ON SIDEWALKS WITH VENDOR ACTIVITIES BASED ON PEDESTRIAN PERCEPTION BY GENDER AND AGE

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## Abstract

This paper presents an investigation of important factors relating sidewalk performance based on pedestrian perceptions by gender and age. Exploratory factor analysis technique and reliability test of the variables are performed on 45 items of sidewalk current condition in order to extract dimensions of pedestrian perceptions in Jakarta and Bangkok. Based on age, male respondents reveals that eight factors are identified as important on sidewalk performance, and labeled on the basis of the attributed covered as sidewalk interaction, comfort, space availability, safety, vendor problems, walking path, vendor regulation, and vendor's attraction. On the other hand, the first seven factors are similarly stated by female respondents. Grouped by age, young respondents reveal nine factors are considered important and arbitrarily named as comfort, sidewalk interaction, safety, vendor's attraction, vendor problems, vendor regulation, walking path, space availability, and sidewalk condition. The presence of vendors are often deemed as obstruction for walking flow, but their activities should be accommodated by establishing policies and management to accept high performance of the sidewalks and to support the city's economy.

**Keywords:** sidewalk, street vendor, factor analysis

## Abstrak

Makalah ini menyajikan suatu penelitian terhadap faktor penting yang berkaitan kinerja trotoar berdasarkan persepsi pejalan kaki menurut jenis kelamin dan usia. Teknik *exploratory factor analysis* dan uji reliabilitas terhadap variabel dilakukan pada 45 item kondisi trotoar saat ini untuk mendapatkan persepsi pejalan kaki di Jakarta dan Bangkok. Berdasarkan usia, responden laki-laki mengungkapkan bahwa delapan faktor yang diidentifikasi sebagai hal penting bagi kinerja trotoar, yaitu interaksi trotoar, kenyamanan, ketersediaan ruang, keamanan, masalah vendor, tempat berjalan, regulasi vendor, dan daya tarik vendor. Sedangkan tujuh faktor pertama sama-sama dinyatakan oleh responden perempuan. Berdasarkan usia, responden muda mengungkapkan sembilan faktor yang dianggap penting, yaitu kenyamanan, interaksi trotoar, keamanan, daya tarik vendor, masalah vendor, regulasi vendor, berjalan jalan, ketersediaan ruang, dan kondisi trotoar. Kehadiran vendor sering dianggap sebagai hambatan untuk berjalan aliran, tetapi kegiatan mereka harus diakomodasi dengan menetapkan kebijakan dan manajemen untuk menerima kinerja tinggi dari trotoar dan untuk mendukung ekonomi kota.

**Kata-kata Kunci:** trotoar, pedagang kaki lima, faktor analisis

## **INTRODUCTION**

Walking is one of the important mode transportation options in some developing cities, including Jakarta and Bangkok, as a result of the introduction of mass rapid transit system. Sidewalks must be built in one side or both sides of the streets to accommodate walking activities. However, many obstructions exist on the sidewalk that cause pedestrians are in difficulties. One of the obstructions is street vendor activities that commonly found in many developing countries. In Jakarta and Bangkok, street vendors exist as well, in which their existences can be either legal or illegal. The amount of vendors increased significantly after the economical crisis in 1998 (Bhowmik, 2005). Vendors are commonly found along sidewalks and usually side by side and/or face to face with permanent shops. As a result, reduction of total sidewalk width occurs in both sides of sidewalk and causes substantial problem to pedestrian traffic.

This paper intends to determine factors affecting sidewalk's performance based on pedestrians' perception, that categorized by gender and age that can be used to predict a set of qualitative variables to determine the extent to which sidewalk's current performance meet pedestrian's expectation. In this study, field observation is performed in the sidewalk where street vendors exist along the sidewalk. Therefore, the presence of vendors is one of the pedestrian's consideration in correlation with sidewalk performance.

## **LITERATURE REVIEW**

### **Perspective of Sidewalk in Asian Countries**

Pedestrian level of service estimation considers flow rates, mean speed, and space, which is originally established in the field of traffic engineering. Therefore, it assumes that pedestrian movement characteristics are similar to vehicles, such as traveling in a linear path, faster speed indicates efficient flow, and more people to a degree indicated congested condition (TRB, 2000). As a result, application of this method produces inaccurate result because walking movement patterns are more complex than vehicles, such as tend to swerve to avoid obstructions, flexibility in route choice, to stop and buy food from street vendors, rest on bench, and chat with an acquaintance, in other words changing from moving to nonmoving behavior. Hence, sidewalks have function as venue for communication (Babiano and Ieda, 2007). Most of developing cities in Asian countries copy transport policy in general, and pedestrian infrastructures regulation in particular from those in Western. Hence, there were mismatch between user and facility as a result of lacking consideration of the socio-cultural value of the place.

In Western countries, sidewalks are defined as walkways that are parallel to highway or street, designed as exterior routes to provided pedestrian accessibility. In some cases, walkways are generally pedestrian path including plazas and courtyard. Pedestrian

plaza, outdoor café, or gathering area may provide in front of some building in business district or downtown, depending on available space within the right-of-way (WDOT, 1997; Zegeer *et al.*, 2002).

Compare to those in Western, Asian are social individuals wherein they usually prefer to do activities together and are always in group than go out alone. Therefore, the streets become destinations themselves and are changed into their activities such as eating places, shopping venues or meeting areas. The differences between private and public space are not clear. Asian pedestrians use the communal area as an extension of living area, a venue for commerce and exchange, and a place for socialize (Babiano and Ieda, 2007). There is a direct correlation between walking and non-movement spaces. Non-movement activities tend to rise in a location with high volume of pedestrians.

Social equity is a major component in street space sustainability. Therefore, it should be provided the accessibility of the street to all users i.e. pedestrians, street vendors, and other street users. Though, the latter is often considered as obstruction of main function of sidewalk to serve pedestrian flow. However, the street vendors are commonly found in most of sidewalk in Southeast Asia. In the name of city's cleanliness and beauty, and reinforce of policy, street vendors are being cleared out from the sidewalks, even this is often met with low compliance. This case rise as a result of difference sidewalk concepts takes on the Western view that it is solely for movement. However, Asian sidewalks do not only serve pedestrian movement but also as a market place and trading venue as well (Babiano and Ieda, 2007). Most of this informal economic sector is a significant presence in commercial areas.

### **Vendors Effect on Sidewalk**

Street vendor was one of the alternative choices for some people who lost their jobs in the formal sector during the financial crisis (Bhowmik, 2005; Walsh, 2010). Regarding street vendor issue, two totally different opinions rise, some disagree with the existence of street vendor at all, while some think that vendor is interesting and made a walk more enjoyable.

The impact of street furniture and street vendors on pedestrian level of service have been investigated (Kim *et al.*, 2008). The research was performed in Waikiki, Hawaii. This research observed the impact of fourteen different obstructions. They included fixed items such as bicycle racks, planter boxes, trees, phone booths, water fountains, mail boxes, brochure bins, newspaper bins, trash bins, and bus stops. The movable items also were observed, such as benches, tables and chairs, coffee carts, and vending carts. The impacts of obstructions were estimated based on two conditions. The first condition was established from the baseline condition (without obstructions) and then simulated the effect of various obstructions on available width, the area for pedestrian, and the flow rate. This research revealed that the larger the dimension of the obstruction, the greater impact on

pedestrian level of service. Also, it could be revealed that coffee and vending carts have a bigger effect which both show decreases in level of service measured regarding area per pedestrian and flow rate.

## **METHODOLOGY**

### **Study Design**

This study performed field data collection in Jakarta, (specifically in Mampang, Sabang, and Jatinegara) and Bangkok (Pratunam, Silom, Bangrak, and On Nut). Data required for this study was pedestrian interview and conducted in June 2010. Interview was undertaken for two days in each location for eight hours per day from 10 a.m. to 6 p.m.

### **Questionnaire**

Three parts of questionnaire was established, the first part referred five issues i.e safety/security, comfort, vendors attraction, movement easiness, and sidewalk performance to collect pedestrian perception on current sidewalk condition. The second part contained some statements on traffic and geometric, behavior and attitudes issues. Both parts of the questionnaire used a seven-point Likert scale with “one” representing strongly disagree and “seven” representing strongly agree. The third part covered respondent’s socioeconomic and travel characteristics, including gender, age, occupational status, monthly income, education level, frequency of walking, and trip purpose.

### **Analytical Tools**

Factor analysis (FA) is a statistical approach that can be used to verify the conceptualization of a hypothesis by analyzing interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions by condensing the information contained in a number of original variables into a smaller set of dimensions with a minimum loss of information (Hair et al., 2006). Factor analysis can also be used to determine the relative importance amongst these dimensions.

The factor analysis and reliability test were conducted firstly for the variables within the factor. The appropriateness of conducting FA procedure was checked by a number of methods such as Bartlett test for presence of non zero correlations, or test of Kaiser Meyer Olkin Measure of Sampling Adequacy (KMO-MSA) (Hair et al., 2006). Then, Cronbach’s alphas were calculated for the most reliable variables. The factor loadings and Cronbach’s alphas were used to indicate the suitability of the variables in describing the factor selected.

## RESULTS

### Respondent's Profile

This study could gather 1861 respondents during data collection process. The proportion of male respondents was larger than female (50.7% vs. 49.3%), whereas proportion of young respondents was larger than old (59.1% vs. 40.9%).

### Important Factors Affecting Walking

In order to investigate pedestrian perception, the factor analysis's procedure was conducted on the 45 statements of sidewalk current conditions (Parts 1 and 2 of the questionnaire).

### Important Factors for Based on Gender

The KMO test resulted in a value of 0.855 (male) and 0.875 (female), which was greater than 0.5. The result also indicated that Bartlett test was significant at 0.001. Using the method of principal component extraction with VARIMAX rotation, eight (male) and seven (female) factors were identified as important and labeled on the basis of the attributed covered (see Table 1). Variables with a factor loading greater than 0.5, were chosen (Hair et al., 2006). These factors were arbitrarily named as **sidewalk interaction, comfort, space availability, safety, vendor problems, walking path, vendor regulation, and vendor's attraction**. Factor loadings of variables, explained variance and Cronbach's alpha of the factors are summarized in Table 1.

Factor 1, named '**sidewalk interaction**', refers to pedestrian's intention when they face vendor activities at the sidewalk and their feelings on vendor presence. Factor 2, labeled '**comfort**', refers to the existence of obstructions along the sidewalk, such as physical features, vendors and other pedestrian obstructions. In addition, the available sidewalk width can accommodate walking and vendor activities. Also, sidewalks cleanliness increases comfortable feelings. Factor 3, called '**space availability**', indicates movement easiness, sidewalk accessibility and space availability for walking movement. Factor 4, named '**safety**', includes items that assess pedestrian perceptions regarding vehicle traffic danger, sidewalk surface conditions, and the possibility of criminal activities. Factor 5, named '**vendor problems**', implies some problems that may arise because of street vendor activities on the sidewalk. Factor 6, called '**walking path**', implies pedestrian's choice of walking path when the sidewalk is crowded. Factor 7, labeled '**vendor regulation**', contains items of pedestrian perceptions on regulation and the enforcement. Factor 8 (arise for male only), labeled '**vendor's attraction**', refers to the existence of street vendors along the sidewalks, and pedestrian intention to look around and to buy something on street vendor's commodities.

### **Important Factors Based on Age**

Table 2 presents the summary the results of exploratory factor analysis and reliability test based on respondent's age. Note that respondent's ages were divided into two groups, namely, young ( $\leq 30$  years) and old ( $> 30$  years). It can be seen that the KMO-MSA test resulted in a value of 0.865 (young) and 0.883 (old), which was greater than 0.5, and the Bartlett test resulted in a value  $< 0.001$ . This indicated that the factor analysis procedure was justified.

The proposed solution has nine (young) and seven (old) factors. Inspection of the output confirms that the factor structures make conceptual sense and that each factor accounts for a substantial portion of the overall variance. The resulting factor structure is presented in Table 2. The factors are arbitrarily named as **comfort, sidewalk interaction, safety, vendor's attraction, vendor problems, vendor regulation, walking path, space availability, and sidewalk condition**. Factor 1, **comfort**, refers to feeling of movement easiness, sufficiency of space for walking, and presences of obstructions at the sidewalk, such as physical features, vendors and other pedestrian obstructions. Also, sidewalks cleanness increases comfortable feelings. Factor 2, **sidewalk interaction**, contains items of pedestrian intention to interact with vendors. Factor 3, **safety**, includes items that assess pedestrian perceptions regarding vehicle traffic danger, sidewalk surface conditions, and crime attacking. Factor 4, **vendor's attractions**, refers to street vendors existence in the sidewalks, intention to look around and buy something on street vendor's commodities. Factor 5, **vendor problems**, comprises any matters arising from street vendor activities. Factor 6, **vendor regulation**, includes perception of vendor regulation and its implementation/enforcement. Factor 7, **walking path**, refers to pedestrian's choice of walking path when the sidewalk is crowded. Factor 8 (arise for young only), **space availability**, refers to some items relating to availability of space on the sidewalk for walking movement. Factor 9 (arise for young only), **sidewalk condition**, includes items that assess pedestrian perception about easiness to access public transport and sidewalk performance.

### **Reliability Test**

Cronbach's alpha test was performed to test the internal consistency of the scale and value greater than 0.7 indicated an acceptable value (Field, 2005). Tables 1 and 2 present the result of Cronbach's alpha test. It can be observed in Tables 1 dan 2 that almost all values are greater than 0.7. Other lower values are considered within the acceptable range ( $\alpha = 0.60$ ) though it quite low (George and Mallery, 2010; Gliem and Gliem, 2003).

**Table 1** Factor Loading, Explained Variance, and Cronbach's Alpha Based on Gender

Variable	Male			Female		
	KMO-MSA: 0.855; Bartlett test: <0.001			KMO-MSA: 0.875; Bartlett test: <0.001		
	Factor Loadings	Variance Explained (%)	Cronbach's Alpha	Factor Loadings	Variance Explained (%)	Cronbach's Alpha
Factor 1: Sidewalk interection (FA-1)		23.834	0.844		11.215	0.846
Q2-15	0.764			0.782		
Q2-13	0.763			0.677		
Q2-14	0.729			0.783		
Q2-16	0.708			0.747		
Q2-8	0.644			0.552		
Q2-1	0.549					
Q1-13				0.586		
Q1-12				0.567		
Factor 2: Comfort (FA-2)		10.725	0.819		26.706	0.861
Q1-10	0.713			0.657		
Q1-9	0.713			0.736		
Q1-6	0.700			0.693		
Q1-7	0.673			0.700		
Q1-8	0.615			0.698		
Q1-5	0.571			0.692		
Q1-4				0.598		
Factor 3: Space Availability (FA-3)		7.321	0.797		6.553	0.837
Q1-22	0.756			0.789		
Q1-21	0.664			0.752		
Q1-23	0.663			0.700		
Q1-19	0.615			0.660		
Q1-20	0.597			0.722		
Factor 4: Safety (FA-4)		6.902	0.832		6.118	0.767
Q1-2	0.889			0.827		
Q1-1	0.845			0.834		
Q1-3	0.794			0.646		
Factor 5: Vendor Problems (FA-5)		4.519	0.698		5.350	0.706
Q1-17	0.785			0.599		
Q1-16	0.770			0.836		
Q1-15	0.705			0.810		
Factor 6: Walking Path (FA-6)		4.026	0.739		3.611	0.769
Q2-12	0.847			0.817		
Q2-11	0.845			0.796		
Factor 7: Vendor Regulation (FA-7)		3.544	0.690		4.300	0.840
Q2-18	0.789			0.861		
Q2-17	0.781			0.882		
Factor 8: Vendor Attraction (FA-8)		5.255	0.849			
Q1-13	0.833					
Q1-12	0.795					
Q1-14	0.704					

**Table 2** Factor Loading, Explained Variance, and Cronbach's Alpha Based on Age

Variable	Male			Female		
	Factor Loadings	Variance Explained (%)	Cronbach's Alpha	Factor Loadings	Variance Explained (%)	Cronbach's Alpha
Factor 1: Comfort (FA-1)		23.755	0.847		23.771	0.847
Q1-9	0.750			0.741		
Q1-8	0.716			0.680		
Q1-10	0.689			0.761		
Q1-7	0.680			0.690		
Q1-6	0.676					
Q1-5	0.603					
Q1-4	0.597			0.640		
Q1-20				0.764		
Q1-21				0.762		
Q1-19				0.728		
Q1-22				0.632		
Q1-11				0.586		
Factor 2: Sidewalk interaction (FA-2)		9.200	0.833		13.138	0.852
Q2-15	0.769			0.786		
Q2-14	0.749			0.743		
Q2-16	0.746			0.735		
Q2-13	0.701			0.744		
Q2-1	0.583					
Q2-8				0.644		
Q2-10				0.564		
Factor 3: Safety (FA-3)		5.727	0.801		6.527	0.812
Q1-2	0.861			0.872		
Q1-1	0.839			0.863		
Q1-3	0.715			0.745		
Factor 4: Vendor Attraction (FA-4)		5.369	0.816		4.422	0.845
Q1-13	0.810			0.720		
Q1-12	0.782			0.689		
Q1-14	0.696			0.660		
Factor 5: Vendor Problems (FA-5)		4.336	0.669		7.808	0.782
Q1-16	0.788			0.755		
Q1-17	0.766			0.710		
Q1-15	0.680			0.691		
Q2-9				0.623		
Q2-3				0.591		
Q2-2				0.554		
Factor 6: Vendor Regulation (FA-6)		3.728	0.781		3.341	0.747
Q2-18	0.858			0.801		
Q2-17	0.819			0.729		
Factor 7: Walking Path (FA-7)		3.522	0.728		4.080	0.696
Q2-12	0.824			0.787		
Q2-11	0.807			0.807		
Q2-6				0.507		
Factor 8: Space Availability (FA-8)		3.183	0.535			
Q1-21	0.758					
Q1-20	0.725					
Q1-22	0.698					
Q1-23	0.633					
Q1-19	0.609					



## DISCUSSION AND CONCLUSIONS

### Discussion

Many street vendors can be commonly found in the sidewalks in South East Asian countries. They exist side by side with shop stores along the sidewalks, and pedestrians get direct impact from the presence of street vendors, such as reduction of sidewalk width, reduction in walking speed, obstruction in movement, and so on. The results of this study

include factors regarding the presence of street vendors at sidewalks that should be considered as the factors affecting sidewalk performance. The finding could be a unique variable for sidewalk performance evaluation compared with previous methods that are mostly studied in developed countries (e.g. TRB, 2000; Landis *et al.*, 2001; Huang and Chiun, 2007). The results of this study indicate that male and female pedestrians consider their sidewalk interaction, comfort, space availability, and safety as important aspect for their walking trip. In the same vein, young and old pedestrians consider comfort, sidewalk interaction, and safety as the important factors for their walking trip.

Jakarta still has a problem with sidewalk infrastructure and law enforcement. Most of the sidewalks currently do not have supporting facilities for pedestrians; thus, pedestrians perceive that the development of sidewalk environment is the most urgent action to enhance sidewalk performance. The biggest problems on factor affecting walking preference in Jakarta are discontinuity and narrow of sidewalk, and unsafe distance with vehicle traffic (Zulkifli *et al.*, 2009). For future planning purposes, encouraging walking activities may be accomplished by increasing safety and comfort, in addition to volume and capacity factors (Jaskiewicz, 2000). Walking activities can be improved by identifying factors that would encourage people to walking more often. Based on these identified factors, some effort should be done to improve sidewalk condition. The condition of location is strongly influence the satisfaction level for pedestrians (Zulkifli *et al.*, 2009). Therefore, improvement of existing sidewalk infrastructure will encourage people for walking more often.

Regarding vendor activities, pedestrian's perception based on gender and age reveal some factors are considered important, namely vendor attraction, vendor problems, and vendor regulation. Besides its positive impacts on socio-economic aspects, vendor activities yield problems on pedestrian traffic flow. There are two different opinions about street vendors. Some prefer no vendors on the sidewalk at all; some think that vendors make a walking activity more enjoyable. Although the street vendors play important role to the economy of the city, their existence are often undesirable activities by the authorities. In fact, the availability of outdoor economic activities seems to be very important for individual family economic. Study in Jakarta by Zulkifli *et al.* (2009) invented some reasons of the importance of presence of street vendor for Jakarta's residents, such as street vendors provide low prices goods-food, approachable selling location, help safety on the

night, and familiar with the consumer. So, the activities of street vendors in Bangkok and Jakarta should be necessary to be as close as possible to the potential customer because the resident tends not to walk very far. Hot temperature, pollution, dirty, and heavy traffic reduce the prospect of walking activities.

### **Conclusions**

Relating to the gender, female group consider their comfort rather than other factors for their walking trip. The most important determinant (the largest total effect) for sidewalk performance in male group is pedestrian perception of interaction, whereas the most important determinant for sidewalk performance in female group is perception of sidewalk condition. These findings agree with previous finding that factor of “vendor attraction” is considered important in male group. Negative impact of interaction on male groups indicates that this variable important but the male group is not satisfy with the interaction activities along the sidewalks, they think that vendor activities are an obstruction for walking. Agree with studied by Bernhoft and Carstensen (2008), that stated male often select the fastest and directly route when walking, otherwise female group take more appreciate on sidewalk facilities such as availability of lighting, crossing bridge and other support facilities on comfort and safety.

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## APPENDIX

Variables	
Q1-1	I feel safe from vehicle traffic danger
Q1-2	I feel safe from trips, slips and falls
Q1-3	I feel safe from intimidation or physical attack
Q1-4	I think that the available sidewalk width can accommodate pedestrian flow
Q1-5	I think that the sidewalk is flat enough to accommodate wheelchair users
Q1-6	I think that the street vendors keep the sidewalk clean
Q1-7	I can move freely without obstruction from physically features: phone boxes, column, bench
Q1-8	I am not impeded by other pedestrians
Q1-9	I can move freely without obstruction from vendors
Q1-10	I have enough space to avoid the vendor's obstruction without decelerating my pace
Q1-11	I feel comfortable walking through this sidewalk with the presence of on street vendors
Q1-12	I am interested in goods sold by vendors along this sidewalk
Q1-13	I intend to buy something from street vendors
Q1-14	I enjoy vendor activities in this sidewalk
Q1-15	I think that too many street vendors occupy this sidewalk
Q1-16	I think that too many buyers cause this sidewalk crowded
Q1-17	I think that the number of pedestrians in this sidewalk is too large, causing this sidewalk crowded
Q1-18	I think that vendor's displays do not obstruct pedestrian movements
Q1-19	I think that the total width of sidewalk is wide enough
Q1-20	I can choose my walking speed freely
Q1-21	I can overtake other pedestrians easily
Q1-22	At the crosswalk, sidewalks are at the same grade level as streets, so I can move easily for crossing roadway
Q1-23	I think that I can enter/exit to/from this sidewalk easily
Q1-24	I can not walk side by side with my friend because the sidewalk width is too narrow
Q1-25	If I want to access public transport, it is easy to find bus stop/BTS Station in this sidewalk
Q1-26	I don't mind delays as long as I am comfortable
Q1-27	From my opinion, this sidewalk is bad for pedestrians
Q2-1	I think this sidewalk is crowded because of a large amount of pedestrians, not the presence of vendors
Q2-2	I think if the vendors is prohibited, the volume of pedestrians will be higher
Q2-3	I found delay when I walk along this sidewalk
Q2-4	The street vendors occupy too many spaces in this sidewalk
Q2-5	I think pedestrians with visual impairment can walk this sidewalk easily
Q2-6	This sidewalk is too narrow to accommodate the vendors and pedestrians
Q2-7	It is easy to interact with the vendors
Q2-8	I want to look around commodities sold by vendors
Q2-9	Walking slowly to enjoy goods from street vendors is inconvenient for other pedestrians
Q2-10	I should walk in the sidewalk although the sidewalk is crowded by vendors
Q2-11	I will still walk on the roadway (pavement) even when the sidewalk is very crowded
Q2-12	In this sidewalk segment, walking on the roadway is more convenient than walking in the sidewalk
Q2-13	I will walk along this sidewalk only for shopping
Q2-14	On street vendors make me easy to buy something
Q2-15	I love shopping along sidewalk
Q2-16	My friends or my relatives like to walk along this sidewalk
Q2-17	I feel that the government should ban the vendors along the sidewalk
Q2-18	I think the regulation of vendors along the sidewalk is not that strict