

# Social Media and Crowd Sourcing to Evaluate and Compare Priorities and Preferences for Sustainable Transportation System

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## Abstract

*To ensure that decisions are made reflecting public needs, public participation has become an indispensable part of transportation planning process. Social media and crowd sourcing are gaining popularity day by day to interact and engage with the general public in various sectors. Though this approach has high potential, its application has been so far been quite limited in the field of transportation planning. This research aims to evaluate the possibility to conduct public participation through the use of crowd sourcing and social media in transportation planning. For this, it uses social media to engage with general people to identify their views on sustainable transportation system. Based on this, it designs an online questionnaire survey to ascertain and prioritize various aspects of sustainable modes of transport, e.g., walking, cycling and public transport environment through Analytic Hierarchy Process (AHP). Through this, the study identifies and compares the perception of general road users and transportation experts regarding sustainable transportation. The questionnaire was spread through social media. A total of 80 general public and 10 transport experts responded to the questionnaire. The survey responses show variations between general public and expert's opinions in prioritizing components of transport systems. Besides, as the most feasible sustainable transportation, public transport was prioritized by highest number of respondents with the provision of facilities for women and children, surveillance for enhanced security and convenience, etc. The information is expected to be highly beneficial for both the academicians and practitioners from relevant backgrounds.*

**Keywords:** Social Media, Public Participation, Sustainable Transportation, Public Transport, Analytic Hierarchy Process (AHP).

## 1. INTRODUCTION

Transportation systems should be developed in such a manner so that it contributes to provide mobility to people without compromising the needs of future generation. Black (2010) attempted to define a sustainable transportation system as one that provides transport and mobility with renewable fuels while minimizing emissions detrimental to the local and global environment and preventing needless fatalities, injuries and congestion. The definition highlights that sustainability is not just being environmentally responsible but transport still needs to achieve its role of providing mobility, safety and comfort. The inadequacy of transport facilities are one of the major bottlenecks to socio-economic development of the major cities and national integration (Mannan et al, 2001). A sustainable transportation system of a city assists in economic and social development of the city life. Economists have argued that for assisting overall economic development an appropriate transport planning is needed. Communities which are successfully improving the sustainability of their transport networks are doing so as a part of a wider program of creating more vibrant, liveable, sustainable cities.

Public participation in transport planning is a recent trend though there is an increasing number of

cases in Europe where the public is involved in the decision-making process. Citizens should be involved in transportation planning phases such as in the identification of transport and mobility problems, in specifying the vision and objectives, in the strategy development process, in suggesting possible solutions and also during the identification and evaluation of those solutions (Rupprecht Consult, 2013). Public participation is based on the belief that people whose lives are affected by transportation planning and investment decisions have a right to be involved in the decision-making process and influence choices that are made. Directly engaging citizens in this process promotes successful problem solving, yields diverse voices and new ideas, and gives the public a sense of ownership of the developed solutions (MARC, 2013).

The context of transport planning has changed dramatically in recent years, raising some difficult challenges but also creating new opportunities for public involvement (Krätzig and Warren-kretzschmar, 2014). Introduction of new media provide new opportunities to involve most citizens and civic organizations in the transportation planning process. Many transit agencies have begun to incorporate social media into their marketing and communications strategies. Though it is being practiced in small scale by some authorities, very few research studies explored the possibility to use social media and crowd sourcing to encourage public participation. Purpose of this research is to evaluate the possibility to promote public participation through the use of crowd sourcing and social media in transportation planning. Finally to identify and compare the perception of general road users and transportation experts regarding sustainable transportation system.

## 2. METHODOLOGY

### 2.1. Social Media Activist Group and Preparation of Questionnaire

The concept of sustainable transportation system of a city expects most trips being made by walking, bicycle or public transport in a safe, secured, convenient, affordable and timely manner with leaving very few trips for car. This study encourages public participation through social media to understand the concept of sustainable transport held in mind of transportation professionals and the general road users. For this, the sustainable transportation system concept was built around three modes – walking, bicycling and public transport (bus), and their various criteria were identified through the participation in social network (Facebook). Finally, the weights of each criterion were evaluated by applying AHP where the data was collected through an online survey with general road users and transportation professionals as respondents.

The online link to the Facebook group: <https://www.facebook.com/groups/855287761258451/>

AHP was used as an appropriate instrument to model the survey questionnaire. AHP implies to Analytic Hierarchy Process which was developed by Thomas L. Saaty in early 1970's. It is a quantitative multi-criteria decision making approach. It assists complex decision making by using a set of pairwise comparison matrix. It also determines the relative importance and gives a ranking to the criterions. From feedbacks and opinions of the members of the social media group 17 criteria were derived to reach the goal of positive sidewalk environment. Similarly 22 criteria were deduced to achieve improved public transportation and 9 criteria for achieving proper cycling environment as a sustainable transportation system of Dhaka city.

The link to the online survey questionnaire: <https://ahpsurvey.untappedideas.com/>

### 2.2. Using AHP Methodology to Prioritize Road User Preferences

The online questionnaire survey was considered as the most appropriate instrument to elicit

comparison and prioritization of road user needs and environmental attributes. The survey inquired about (1) the respondent's socio-demographic profile, (2) their preference between two paired comparisons of criteria and (3) their preference between three proposed sustainable transport systems of Dhaka city. In point 2 and 3 survey participants were asked to choose between paired comparisons (e.g. A and B) using a scale value from 1 to 9. A choice of 1 meant that the survey participant expressed an equal sense of preference between A and B while a choice of 9 proximate to B meant that the participant expressed an extreme sense of preference for B over A and vice versa. For example, choose the relative importance of Safety consideration over Mobility concerns in evaluating Cycling as a sustainable transportation system of Dhaka. If Safety consideration should be strongly prioritized then assign a value of 5, which stands for strong importance in Saaty's (2008) scale, by encircling the number or placing a tick mark on it. The comparison is shown in Figure 1.

Mobility	9 8 7 6 5 4 3 2 1 2 3 4 (5) 6 7 8 9	Safety
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**Figure 1. Pairwise comparison between two criteria in Analytic Hierarchy Process (AHP)**

Saaty's (2008) scale with explanations for AHP comparison is shown in Table 1.

**Table 1. Intensity of importance with explanations for AHP comparison (Saaty, 2008)**

Intensity of importance	Definition	Explanation
1	Equal importance	Two items contribute equally to the objective
3	Moderate importance	Experience suggests that one be slightly favored over the other
5	Strong importance	Experience suggests that one be strongly favored over the other
7	Very strong importance	Item strongly favored and its priority demonstrated in practice
9	Absolute importance	Importance of one over another affirmed on highest possible order
2,4,6,8	Intermediate values	Used to represent compromise between priorities listed above

By analyzing their feedbacks, the preferences of sustainable transportation system was determined and evaluated. However, it provided important and crucial insights about citizen needs, preference, and prioritization. Before the questionnaire survey was distributed, the investigator conducted a pilot test to determine the degree of difficulty of the questions being asked, establish the length of time to answer the questionnaire and determine level of response of respondents so as to ensure effectiveness, reliability and validity of the questions. The questionnaire was spread through the social media. Total of 80 general public and 10 transportation experts participated in the survey questionnaire.

### 3. RESULTS AND DISCUSSION

This section explains the results of the survey, which include the overall socio-demographic characteristics of respondents and comparison of average weightage values of criterions. The weightage values are assigned based on the survey feedback analysis of general public and transportation experts. Table 2 shows the socio demographic characteristics of general public respondents where it shows that majority of the survey participants were male (male to female proportions 87 to 13). There was also a significantly young population cohort with more than half of the participants belonging to the 18–25 age group and 80% were still studying.

**Table 2. Socio demographic characteristics of public respondents**

Attributes	Categories	City sample N= 80 (%)
Gender	Male	87
	Female	13
Age range	<18	4
	18-25	76
	25-40	14
	40+	4
Education	<College	7
	College	5
	Undergrad	75
	Graduated	17
Employment	Employed in office	19
	Self employed	5
	Unemployed	76
Car ownership	Family car	36
	Personal car	8
	Do not own car	56

According to survey responses of both general public and experts, it appears that public transportation is the most prioritized transport (55.5% by experts and 54.7% by general public) among three followed by walking (30.5% by experts and 26.1% by general public) and cycling (14.1% by experts and 19.1% by general public). The priorities of weights for the three mode of transport are given in Figure 2.

In case of sidewalk, the results of public respondents present the criterions with the highest priority values include: toilets and dustbins provision (8.1%), no hawkers on footpath (7.7%), facilities for disabled people (6.6%), traffic signals provision (6.4%), provision of evening lights (6.2%) where necessary. Where the experts think that evening lights provision (13.5%), seating facilities at stations (11.3%), facilities for disabled people (8.9%) and shed providing roads (5.9%) should be given highest priority. The comparison of the global priority of weights for all positive sidewalk environment criterions are shown in Figure 3.

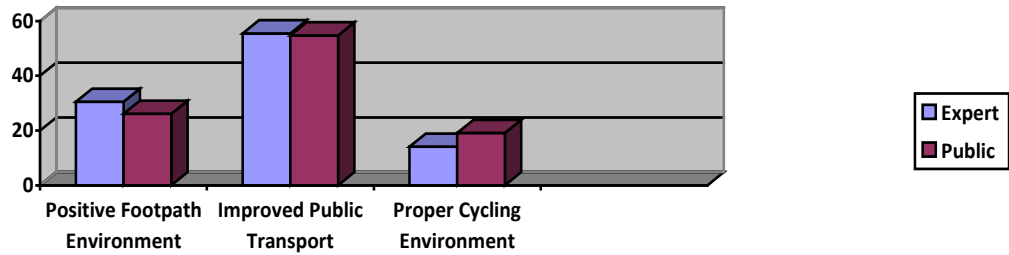


Figure 2. The global priorities of weights for the three sustainable modes of transport

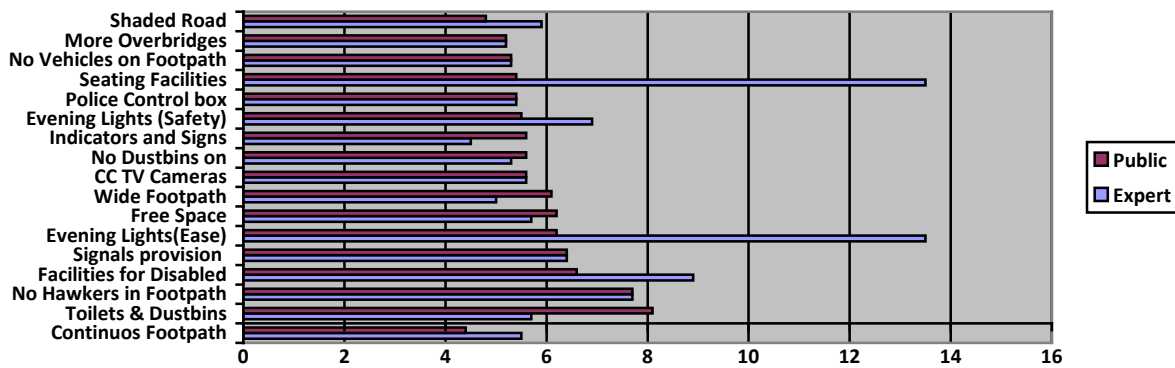


Figure 3. The global priorities of weights for positive sidewalk environment criteria

The results of the global priority of weights for proper cycling environment criteria are given in Figure 4. The criteria with the highest priority values include: separate crossing system (19.9%), provision of evening lights (19.1%), speed monitoring (15.7%), parking facility (13.2%) and provision of traffic signals (12.0%). On the other hand, the experts thought is also the same as the general citizens as they have given priority to the same factors. So, here we find consensus between the experts and public.

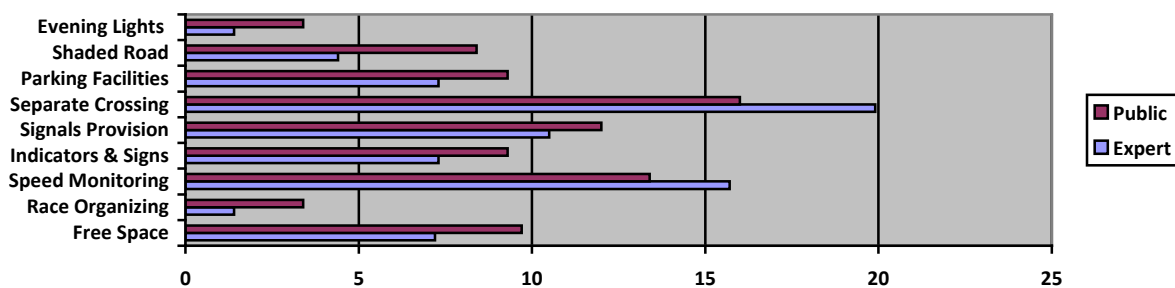


Figure 4. The global priorities of weights for proper cycling environment criteria

The results of the global priority of weights for public transport criteria are given in Figure 5. From the results it appears that the criteria with the highest priority values assigned by public are: facilities for women and children (9.93%), CC TV Camera provision (8.97%), reduced student fare (7.3%), proper license giving system (6.48%). Here a major difference was found between the results of public and experts is that experts think that behavior of drivers and conductors (12.5%), neat and clean transport (11.8%), facilities for women and children (10.5%), bus stoppage fix and monitoring (6.6%) are most important for a sustainable public transport.

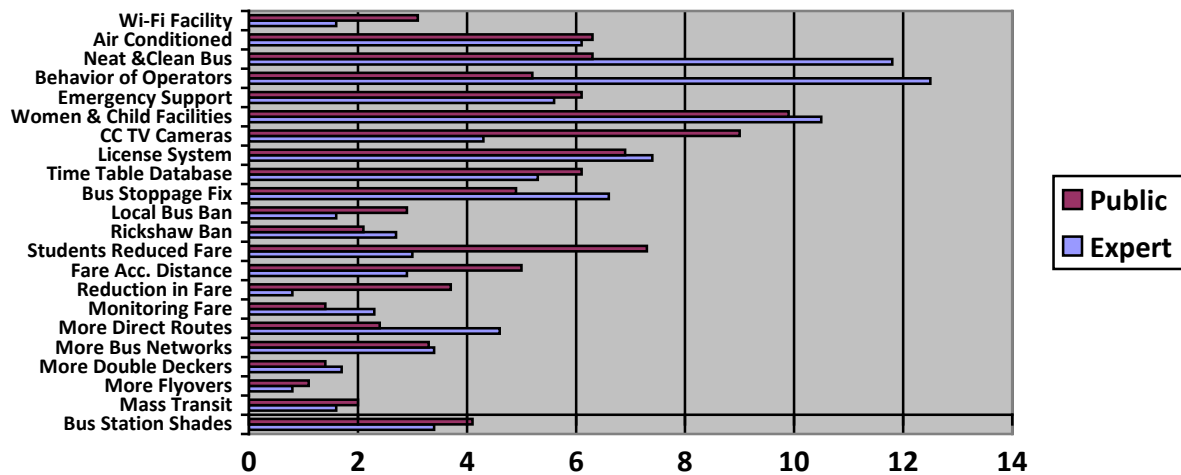


Figure 5. The global priorities of weights for an improved public transport criteria

## 4. CONCLUSION

From the feedback results it appears that there exist a difference in perception between transportation experts and general road users about sustainable transportation system. For certain criteria it is found that the opinion of experts and general public varies a lot while ranking criterions. In fact variations are also found between expert and public individual's feedback results. This study evaluates the role of social media as a public participation tool in the decision making process of transportation planning of a country. It will also provide a way to make ranking and compare between different criteria and alternatives of a transportation plan or a project. For planners in future, this study will assist to incorporate necessities of users as public input in the planning process not limited to only transportation sector.

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