# Multi-Criteria Analysis to Prioritize User Expectations at Traffic Signal

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## Abstract

Traffic signals regulate complex traffic situations and minimize conflicts to enhance the safety of all road users. Further, traffic signals aim to provide an orderly flow of traffic to minimize delays. However, poorly designed traffic signals can result in user inconvenience. Discrepancies between road users at traffic signals can have an impact on the smooth flow of traffic and the effectiveness of travel. The objective of this study was to identify and prioritize the user expectations at traffic signals considering different user groups, such as drivers, pedestrians and passengers, to provide a resource for agencies that are responsible for implementing and managing traffic signals. From the literature review, three main categories of issues and their relevant parameters concerning traffic signals were identified: safety, delay and ease of use. Key parameters identified for safety are conflicting turning movements, red light violations, jaywalking, and lightings at the pedestrian crossing at night time. Effects of the near-side bus stop, the higher number of intersecting approaches at signals, number of heavy vehicles, peak hour and on-street parking were identified as delay-related parameters, while the visibility of traffic signals and countdown timers were identified as ease of use, related parameters. These issues arise because of the conflicts of the behavioural and expectation difference among different road users. A survey was conducted to understand the priorities for the above-identified categories and their parameters for different road users. The questionnaire is distributed online and shared among different groups of people via social media. This study obtained responses from 357 participants via the online questionnaire. A scoring method was used to identify the participant's expectations on each parameter. The weightage of each parameter was calculated according to the score given for each parameter by participants. Collected data were analyzed using the multi-criteria analysis. The final weightage values obtained from the analysis are used to prioritize the parameters. From the analysis, it was found that all road users prioritize their safety more at the traffic signal than delay and convenience of use. Further, road users are giving slightly higher importance to ease of use than delay. Drivers and passengers give more importance to red-light violations, jaywalking and high speed at the end of the amber period for the safety parameter. According to drivers, far-side bus stops and noise from vehicles have the least priority. Pedestrians stated that the lighting at the pedestrian crossing (for night-time use) and conflicting turning movement of vehicles are having the highest impact. Pedestrians are given the least priority for longer cycle times and emissions from vehicles. Further, expectation differences in each subset of groups were analyzed by considering age, gender and mode of travel.

***Keywords:*** *Multi-criteria analysis, Traffic Signals, Simple Additive Weightage (SAW), Safety, Delay, Ease of Use*

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