

Abstract

This study aims to estimate the number of passengers and potential revenue for the Jakarta MRT Phase 2A Station, which is currently under construction. Given the lack of historical data for the stations that are not yet operational, a Markov Chain approach was adapted to model passenger transitions between the operational stations (Phase 1). Furthermore, a clustering method was applied to group the new stations based on regional demographic characteristics, preceded by data dimensionality reduction using Principal Component Analysis (PCA).

Initially, the implementation of the K-Means method demonstrated suboptimal clustering results. To perform a Markov Chain, clusters containing a combination of Phase 1 and Phase 2A stations are required. However, from experiments with three and four clusters using K-Means, only two clusters successfully demonstrated this combination. Therefore, this study turned to the Fuzzy C-Means (FCM) method. FCM successfully grouped stations into four clusters, three of which contained a combination of Phase 1 and Phase 2A stations.

Overall, the study results indicate that the addition of new stations will contribute to significant increases in ridership and revenue at each station, with peak commuter observations occurring on weekdays (particularly Tuesdays and Wednesdays). The extended Markov Chain model projects an average daily ridership increase of 27.5% on weekdays and 43.8% on weekends for Phase 2A. Estimated daily revenue is expected to peak at approximately IDR 1.216 billion on Tuesdays, with Monas Station identified as the largest revenue contributor among Phase 2A stations. These findings provide crucial implications for business planning, operational strategies, and future Transit-Oriented Development (TOD) development.

Keywords: MRT Jakarta, Passenger Estimation, Revenue, Markov Chain, Fuzzy C-Means.