PROFILING SRI LANKAN CYCLISTS USING CLUSTER ANALYSIS

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ABSTRACT - Cycling is recognized as a sustainable and healthy mode of transportation. Cycling has been declining over the years in Sri Lanka. Understanding the cycling behaviours is important to encourage cycling. This study analyzes information regarding cyclists, which are purposes of cycling, frequency of cycling for the particular purpose and the approximate cycling distance per trip. The results obtained from the Two-Step Cluster method resulted in two clusters leading to two cyclists' profiles. The largest cluster is shopping oriented, which consists of individuals using cycling on several days a week for shopping purposes and also recreation and getting to or from public transport stops purposes mostly. The smallest cluster consists of commuter cyclists who are daily cycling users for the purposes of getting to and from school/ university and work. The findings can be informed to transportation authorities in developing interventions and enhance cycling infrastructure, focusing the obtained cycling profiles to promote sustainable transportation systems in Sri Lanka.

Keywords: Cycling; Behaviour; Perception; Profiles; Sri Lanka.

1. INTRODUCTION

Cycling is a sustainable transportation mode which provides environmental, social, and economical benefits [1]. Cycling provides a number of benefits to the people including preventing sedentary lifestyle and associated health problems [2]. Since traffic congestion, air pollution and sedentary lifestyles are issues which cities around the world are attempting to address, it is important for urban planning and policymaking to understand the various needs and behaviors of cyclists [3]. Proposing interventions and infrastructure improvements to specific cyclist groups can enhance the cycling experience and encourage more people in active transportation [4]. Clustering cyclists has been shown to be an effective strategy to identify meaningful differences in patterns and behaviours [5]. This study aims to identify the distinct profiles of cyclists, based on the purpose of cycling, frequency of cycling and cycling distance per trip for a particular purpose. Therefore, identifying distinct groups of people who can be addressed separately is more beneficial, as they have different motivations and are affected by policies and interventions differently [6].

2. METHOD

Data on cycling behaviours were collected through a questionnaire survey and 859 cyclists participated in the questionnaire. The purposes for cycling (Recreation/ Exercise, Getting to and from school/ university, Getting to and from work, Getting to and from shopping, Getting to or from public transport stop) along with the frequency for particular purpose (Daily, Several days a week, Once a week, Once a month, Very rarely) and approximate distance covered per trip are obtained from the questionnaire. While the data collected aims to represent the whole Sri Lanka, it is important to note that cycling behaviors can vary significantly across different regions. The results should be interpreted with this variability in mind, and further localized studies may be necessary to fully understand regional differences. Two-Step cluster analysis, a data-driven clustering technique suitable for handling mixed

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data types, was performed to identify distinct clusters of cycling behaviors. This method automatically determines the optimal number of clusters based on log-likelihood distance measures.

3. RESULTS AND DISCUSSION

The cluster analysis identified two distinct groups of cyclists. The largest group, constituting 65.4% of the sample, is shopping-oriented cyclists. These individuals cycle several days a week for shopping, recreation, and reaching public transport stops, with an average distance of 2.09 km per trip. The smallest group, making up 34.6% of the sample, is commuter cyclists. These cyclists ride daily for commuting to school, university, or work, averaging 2.98 km per trip. However, despite this average distance of 2.98 km of the cluster, the analysis shows that the average distance specifically for sample commuting to school, university, or work is notably higher which is 5.4 km. Figures 1 and 2 illustrate the cluster sizes and comparisons among the two groups, respectively.

The silhouette coefficient of the cluster analysis, measuring the similarity of each data point to its assigned cluster compared to other clusters, was found to be 0.4. This value suggests that, on average, the data points are reasonably well-clustered and that they are closer to the members of their own cluster than to those of neighboring clusters.
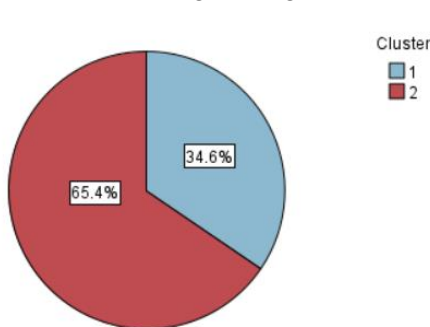
Figure 1. Cluster size
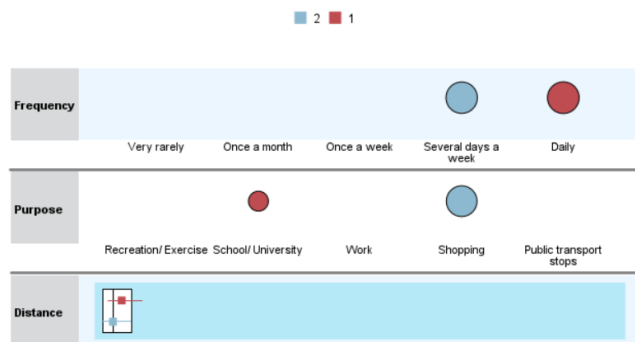
Figure 2. Cluster comparison

Each cluster represents a unique group with specific cycling behaviors and needs, offering policymakers and urban planners a valuable insight for targeted infrastructure and policy interventions. Shopping oriented cyclists' group tend to use bicycles as a convenient mode for short-distance errands. Shopping-oriented cyclists often express concerns about the lack of dedicated cycle lanes and secure parking facilities near shopping areas. Also, this group consists of recreation cyclists who cycle for fitness, leisure, and individuals who cycle as a mode to access public transport. These cyclists often require well-maintained paths in parks and connectivity between cycling routes and public transport stops. Enhancing cycle parking and integrating transit systems can promote this form of multimodal transportation, as seen in studies from other countries [7]. Improvements in the infrastructures can significantly enhance the cycling experience of this group and encourage more frequent use. Commuter cyclists cluster use bicycles for daily commutes to school, university and workplaces. Commuter cyclists often seek safe and direct routes to minimize travel time and ensure safety during peak hours. Implementing dedicated cycle lanes and secure bicycle parking at workplaces, schools and universities could address their needs effectively. Previous studies have highlighted similar infrastructure needs in urban areas to support commuter cyclists [8]. Similar profiles can be found in other modes of transportation in studies on public transport users, which identify categories such as daily commuters, occasional riders, and leisure travelers, each with distinct needs and behaviors [9]. Understanding these profiles has led to tailored services like express routes for commuters and enhanced services for leisure travelers. Such comparisons underscore the importance of recognizing diverse user needs to inform infrastructure and policy decisions. Furthermore, the distinct patterns of cycling behavior identified

through cluster analysis can be used to promote multimodal transport integration, making it easier for cyclists to switch between cycling and other modes of transportation.

4. CONCLUSION

In conclusion, the study highlights the diversity of cycling behaviors and needs among cyclists. The two clusters obtained are shopping oriented cyclists and commuter cyclists. By identifying these distinct clusters, policymakers and urban planners gain valuable insights into the motivations and patterns of cycling and these results can be used in proposing infrastructure and policy interventions to promote cycling as a sustainable mode of transportation and recreation.

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