Smart Mobility Solutions for Urban Transportation in ASEAN: A Bibliometric Study of Trends and Innovations

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Abstract. The ASEAN region faces unique challenges in urban transportation due to rapid urbanization, increasing population densities, and the growing demand for sustainable mobility solutions. This study does a thorough bibliometric analysis of the patterns and advancements in smart mobility, with the objective of tackling these difficulties between 2013 and 2023, focusing on 1,249 peer-reviewed publications. The analysis shows a consistent increase in research effort, with publications reaching their highest point in the past two years. The study identified six main research areas: Intelligent Transportation Systems, Public Transportation, Smart City, Urban Mobility, Autonomous Vehicle, and Advanced Mobility Technologies. The findings suggest a transition from conventional transportation systems to integrated, technologically enhanced solutions prioritizing sustainability and efficiency. The study emphasizes the importance of innovation in addressing urban transportation issues in ASEAN cities and proposes potential areas for further research, including incorporating emerging technology and analyzing socio-economic effects.

Keywords: urban transportation, ASEAN, smart mobility, intelligent transportation systems, bibliometric analysis.

1 Introduction

Urban transport management has become more difficult in the Association of Southeast Asian Nations (ASEAN) region as a result of the amazing urban development of recent decades. Using cutting-edge technology and data-driven methods to improve transportation networks, or smart mobility, has become a vital answer to these problems. The demand for efficient, enduring, and astute transportation systems is increasing alongside the development of Southeast Asian cities [1].

Smart mobility is one of the digital technology components that are integrated into the idea of smart cities to raise living standards, lessen environmental effects, and increase the effectiveness of urban services [2]. In the context of ASEAN, smart mobility

goes beyond simple technical integration to include adjusting innovations to regional requirements and conditions, which differ greatly around the region [3].

The purpose of this bibliometric study is to examine, with an emphasis on urban transportation, the developments and trends in smart mobility particularly within the ASEAN area. Though smart cities have received more and more academic attention worldwide, thorough research that gather and summarize the development of smart mobility concepts specific to Southeast Asian cities is conspicuously lacking. This study will map out the scholarly terrain using bibliometric techniques, pointing up important patterns, foundational works, and new themes in the literature over the last ten years.

2 Literature Review

Smart mobility is the umbrella term for a variety of technologies and approaches intended to improve urban transportation by increasing its effectiveness, sustainability, and resident-responsiveness. Driven by developments in IoT, big data analytics, and artificial intelligence (AI), which are changing the way metropolitan transport networks function, this sector has grown significantly globally [4][5].

A vital component of smart cities, mobility is necessary to lower carbon emissions, enhance air quality, and improve urban life [2]. Real-time traffic management systems, intelligent ticketing and payment systems, and mobile application integration of several transportation options are examples of smart mobility solutions [1].

Specializing on the ASEAN region, its varied socioeconomic and geographic environment creates a special fusion of problems and breakthroughs. Thuzar [6], for example, looks at how Southeast Asia's fast urbanization has increased pollution and traffic congestion, making the use of smart mobility solutions imperative. Particularly for Vietnam, the research by Nguyen & Mogaji [7], emphasizes how government policies support smart transportation networks in developing nations.

3 Methodology

The method used in this research is a quantitative method to identify trends and innovations in smart mobility solutions for urban transportation within the ASEAN region. Meanwhile, for data analysis and visualization, bibliometric analysis is used using R-Packages and Biblioshiny WebInterface software. There are five stages carried out in this research, namely determining keywords that are relevant to the research topic, searching for data according to the keywords, selecting articles, data validation, and data analysis. Bibliometric analysis, derived from conventional literature reviews [8] and systematic literature reviews, involves the statistical examination of published articles and their citations to assess their influence [9].

The papers included in this study are English language literature found in the Scopus and Web of Science databases. These papers contain specific keywords such as “smart mobility," "intelligent mobility," "connected mobility," "autonomous mobility," "future mobility," "innovative mobility," "urban mobility," "city mobility," "smart transportation," "urban transportation," "intelligent transportation," "city transportation," "public

transportation," and "transportation system" in their title, abstract, or keywords. Additionally, the study focused on ASEAN Countries, specifically "Indonesia," "Malaysia," "Thailand," "Singapore," "Vietnam," "Philippines," "Brunei," "Cambodia," "Laos," and "Myanmar." The scope of our data collection method was limited to publications published between 2013 and 2023. The assessment exclusively focused on review papers, articles, and journals.

4 Results

4.1 Main Information

The publications that the author used in this research were publications from 2013 to 2023. The paper using only three types of documents, namely articles, review articles and journals. Using selected keywords, a search was conducted on the Scopus Database and Web of Science for a period of around ten years.

This search yielded a total of 1249 items. The article document type contains 1161 articles and the review article contains 88 document type. The data on smart mobility trends and innovation in ASEAN reveals that the average yearly publishing rate is 4.05, with an average annual citation per document of 24.1 and a total of 8208 references.

4.2 Most Relevant Affiliates and Most Citations

Analysis of publication trends between 2013 and 2023 reveals annual variations. In ASEAN countries, the number of scholarly papers on smart mobility trends and innovations peaked in 2022 and 2023 with 232 and 255, respectively. 4.05% is the average growth rate of publication trends in ASEAN countries with the topic of smart mobility.

According to the analysis results, the affiliate with the highest number of publications is the National University of Singapore, with a total of 207 publications. Following closely behind is the Nanyang Technological University, with 201 articles. In addition, the third and fourth highest number of publications were produced by the Massachusetts Institute of Technology and University of Malaya, respectively, with a combined total of 55 publications. The remaining articles are limited to a range of 20-50.

4.3 Co-Word Analysis

According to Figure 4, this study has identified 6 clusters of primary theme issues that are significant, closely related to, and align with the study of Smart Mobility Solutions for Urban Transportation in ASEAN Countries. There are 6 clusters, which are listed below:

- Cluster 1 (Red) is about Intelligent Transportation Systems, related to intelligent transportation systems, vanet, optimization, big data, clustering, routing, intelligent transportation, mobility, traffic flow, intelligent transportation system (its), vehicular ad hoc networks, planning.

- Cluster 2 (Blue) is about Public Transportation, the keywords are public transportation, transportation, covid-19, autonomous vehicles, thailand, logistics, service quality.
- Cluster 3 (Green) is about Smart City, related to smart city, internet of things, blockchain, security, smart cities, smart mobility, internet of things (iot), privacy, sustainable development.
- Cluster 4 (Purple) is about Urban Mobility, related to urban mobility, sustainability, climate change.
- Cluster 5 (Orange) is about Autonomous Vehicle, the main keywords are public transport, traffic congestion, autonomous vehicle.
- Cluster 6 (Brown) is about Advanced Mobility Technologies, related to intelligent transportation system, deep learning, machine learning, artificial intelligence, deep reinforcement learning.

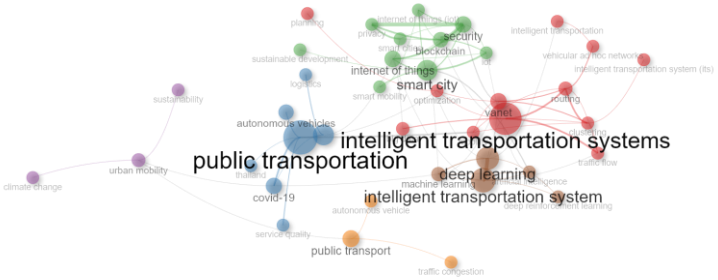

Fig. 1. Network Co-occurrence Map using Each Author's Keywords

5 Conclusions

Research on smart mobility is growing strongly, as seen by the bibliometric analysis carried out over a ten-year period (2013–2023) using data from Scopus and Web of Science. Publications have increased significantly in the final two years of the study period. More specifically, in 2023 publishing peaked at 255 articles, indicating a growing interest and noteworthy progress in this area. The average rate of publication trend growth was 4.05%, indicating a consistent rise in academic interest in smart mobility among ASEAN nations.

With a sizable 207 articles, the National University of Singapore leads the study's results, suggesting a focused effort to progress smart mobility research in the area. Nanyang Technological University follows closely with 201 publications. The research produced by these universities not only emphasizes Singapore's important position in smart mobility research but also the city-state's dedication to being a leader in sustainable urban transportation options.

Six primary research clusters that offer a thorough picture of the breadth and depth of the topic were also identified by the theme analysis. The clusters include anything from "Intelligent Transportation Systems" with an emphasis on big data and

optimization to "Advanced Mobility Technologies," which highlights the part artificial intelligence and machine learning play in developing transportation solutions. This multiplicity of topics suggests a multidisciplinary strategy to address the challenges related to urban mobility in fast changing urban settings.

Declaration of Competing Interest. The authors affirm that they do not possess any identifiable personal relationships or competing financial interests that might have appeared to exert an influence on the research presented in this article.

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