



The Effectiveness of Smart City Implementation Through the TransJogja Application

Zidan Achmad Raihan¹, Muhammad Fadhilah², Rizal Aprianto³

¹ *Departement of Road Transportation System Engineering*

² *Departement of Road Transportation System Engineering*

³ *Lecturer of Polytechnic of Road Transportation Safety*

zidanraihan27@gmail.com¹, muhammadfadhilah08@gmail.com², rizal.apr@pkjtj.ac.id³

Abstract

The implementation of the smart city concept in Yogyakarta is realized through the development of digital based public transportation services, one of which is the Trans Jogja application. This study aims to evaluate the effectiveness of the Trans Jogja application in supporting urban mobility and improving the quality of public transportation services. Using a descriptive qualitative approach, data were obtained through interviews, field observations, and document analysis. The findings indicate that the Trans Jogja application plays a significant role in enhancing the accessibility, efficiency, and convenience of bus services by providing real-time information, intermodal integration, and digital payment systems. However, several challenges remain, such as underutilized routes, discrepancies in travel time estimations, and the need to improve bus stop facilities. The study recommends the development of application features, improvement of supporting infrastructure, and public education to encourage a shift from private vehicles to public transportation. These efforts represent a strategic step toward realizing inclusive, efficient, and sustainable mobility in Yogyakarta as a smart city.

Keywords: *Public Transportation, Service effectiveness, Smart city, Smart mobility, Trans Jogja*

1. Introduction

The increasing rate of urbanization can lead to various challenges such as waste management, education, transportation, welfare, and economic issues, as well as healthcare services. This urban growth aligns with the advancement of modern technology and an improving standard of living, which also contributes to a higher life expectancy. Consequently, there is an increasing demand for adequate residential environments, sufficient public spaces, and easy access to public services [1].

One appropriate solution is the implementation of the smart city concept to address these needs through the integrated utilization of information and communication technology [2] Yogyakarta, as one of Indonesia's leading educational cities with numerous universities and tourist destinations, requires an efficient and integrated public transportation system to support its urban dynamics [3]. One of the efforts to improve public transportation services is through the implementation of the Bus Rapid Transit (BRT) system, which utilizes specialized infrastructure technology to meet the mobility demands of the public [4]

The aspects of sustainability and connectivity are crucial to the development of a smart city, as they facilitate smooth and efficient mobility for its residents [5]. To fulfill these aspects, the Trans Jogja Bus Rapid Transit system utilizes the Trans Jogja application. This represents a concrete implementation of the smart city concept in Yogyakarta, providing an integrated public transportation service accessible via smartphones. The application offers real-time information on routes, schedules, bus stop locations, and vehicle tracking. This innovation aligns with the objectives of the Jogja Smart Province master plan, which emphasizes sustainability, innovation, and efficiency [6]. However, the implementation of technology does not guarantee success without effective execution. Therefore, it is essential to evaluate the effectiveness of the Trans Jogja application in order to enhance the quality of public services particularly in terms of ease of access to the application, bus arrival accuracy, and user satisfaction [7]. Such an evaluation can serve as a basis for improving the Trans Jogja bus service.

2. Literature Review

2.1. Effectiveness

Effectiveness can be defined as an indicator of success in achieving specific objectives, reflecting the extent to which a process can produce the expected outcomes [8]. Effectiveness can also be understood as the ability to select the most appropriate goals from among several relevant alternatives. Furthermore, effectiveness not only focuses on the final outcomes but also emphasizes the process of determining the best methods to achieve them, including the evaluation of various options and the identification of the most optimal solutions.

[9] Stated that the success of an activity in relation to its predetermined objectives is referred to as effectiveness. Effectiveness is defined as the achievement of desired goals or outcomes regardless of the resources expended, such as effort, time, cost, thought, and other contributing factors [10]. Effectiveness refers to the ability of a unit to achieve its expected goals and objectives. As effectiveness is a key factor in an organization's success, it is essential to ensure that the right tasks have been identified before carrying them out effectively. Effectiveness is a term used to describe an action or activity that successfully achieves its intended goals as planned. According to the *Kamus Besar Bahasa Indonesia* (Indonesian Dictionary), the word 'efektif' means 'to have an effect' or 'to produce results,' and also refers to something that has come into effect or is being applied. Therefore, effectiveness relates to the success of an effort in producing outcomes that align with its targets and objectives. The word 'efektif' is derived from the English word 'effective,' which means successful or well-executed.

According to [11] several factors influence work effectiveness within an organization. First, internal organizational aspects such as structure, culture, and the availability of resources form the foundation of operations. Second, external factors, including market conditions, regulations, and competition, require organizations to be adaptive. Third, human resources through their competencies, motivation, and job satisfaction determine individual contributions. Fourth, the role of management in implementing policies, supervision systems, and employee development is essential to drive team performance. These four elements are interrelated, where a weakness in one aspect can affect overall outcomes. Understanding these factors is crucial for organizations aiming to achieve their goals optimally in an ever-changing environment.

2.2. Smart City

The smart city concept is an urban management approach based on Information and Communication Technology (ICT), focusing on three main functions: sensing, which involves monitoring urban resources through sensors and the Internet of Things (IoT); understanding, which refers to analyzing data using big data analytics and artificial intelligence (AI); and controlling, which ensures efficient operations such as traffic optimization and energy distribution [12]. The goal is to enhance public services, resource efficiency, and environmental sustainability, encompassing the dimensions of economic development, smart mobility, and intelligent governance [13]. However, its implementation faces several challenges, such as the digital divide, high infrastructure costs, and data privacy risks, highlighting the need for a balance between technological innovation and social engagement.

Terminologically, a smart city is defined as a city that leverages digital technology to integrate various urban aspects such as physical infrastructure, social life, and economic activities in order to create a more efficient, comfortable, and sustainable environment [14]. At its core, the smart city concept emphasizes the use of information and communication technology to improve public services, optimize resource utilization, reduce energy waste, and promote green economic growth ultimately making cities more connected, efficient, and livable for all residents.

The smart city concept emerges as a solution to urban challenges by integrating digital technology, effective governance, and sustainable development to improve the quality of life for citizens. Its six core principles serve as the foundation for realizing a smart city that prioritizes not only innovation, but also inclusiveness, sustainability, and responsiveness to the needs of the community [15]. The following is an in-depth explanation of the six core principles that underpin the realization of a smart city. According to [16] there are six factors that form the foundation of the smart city concept, namely:

1. **Smart People**
This refers to individuals or groups with a high level of education, obtained through either formal or non-formal pathways. Such education serves as the foundation for developing human resources (HR) with the knowledge and skills to utilize technology effectively. Moreover, human development also reflects the evolution of a society's social and cultural character, which progresses in line with improvements in educational attainment.
2. **Smart Environment**
A sustainable environment is one that provides comfort and a high quality of life not only for the present generation but also for future generations. It encompasses both physical aspects—such as air, water, and open spaces—and non-physical aspects, including social, cultural, and psychological conditions. These elements must be managed wisely to ensure long-term preservation and functionality.
3. **Smart Governance**
Modern governance in policy formulation is grounded in several fundamental principles, including the rule of law, human values, justice, and democracy. Additionally, the resulting policies emphasize the importance of public participation, transparency, professionalism, and accountability. These principles are all directed toward ensuring that implemented policies are efficient, effective, and capable of addressing the needs of society in a sustainable manner.
4. **Smart Economy**
Rapid economic growth, accompanied by an increase in per capita income, has a positive impact on the financial well-being of society. This reflects improvements in living standards, purchasing power, and overall quality of life as outcomes of sustainable economic development.
5. **Smart Mobility**
Transportation or mobility mechanisms are designed to efficiently meet human needs through fast, accurate, and minimal movement. The primary goal of such systems is to reduce travel time, travel burden, and negative impacts on the environment and quality of life.
6. **Smart Living**
The fulfillment of safety, security, convenience, and comfort in daily life are key factors that directly influence the quality of life within a community. These factors serve as important indicators in assessing the extent to which an environment can support a decent, healthy, and productive life for all segments of society.

2.3. Smart Living

Smart living is essentially a concept that involves the automation of various aspects of daily life, aimed at enhancing efficiency, comfort, and overall quality of life for the community [17]. According to [18] smart living is a perspective and mindset that reflects a paradigm of

living that is thoughtful, practical, and creative in managing everyday life. This concept not only emphasizes the aesthetic aspects of living spaces but also takes into account the needs and conditions of the residents, as well as the impact on the surrounding environment. Thus, smart living represents a holistic approach that integrates efficiency, comfort, and sustainability into modern life.

This concept is also applied in the transportation sector, such as through the use of electric vehicles, digitally-based public transportation systems, and intermodal integration that facilitates community mobility. In a broader context, smart living is part of the development of smart cities, which integrate information and communication technology to manage resources sustainably, enhance public services, and create a safer, healthier, and more inclusive living environment for all citizens.

Smart living enables energy savings, waste reduction, and improvements in the comfort and efficiency of daily activities [19]. Beyond its technological aspects, smart living also touches on social and cultural dimensions, such as citizen engagement in data-driven decision-making and the enhancement of digital literacy to foster an adaptive and participatory society. Smart living emphasizes the importance of integrating technology, people, and the environment to create a better and more sustainable way of life. The implementation of this concept requires not only adequate digital infrastructure but also a shift in public mindset toward a smarter, more efficient, and environmentally conscious lifestyle.

2.4. Application Trans Jogja

The Trans Jogja application is a digital platform designed to support the Bus Rapid Transit (BRT) system in Yogyakarta. It allows users to access essential information such as departure schedules, real-time bus locations, bus stop positions, and travel routes. The concept reflects the implementation of smart mobility within the smart city framework, which involves the use of information technology to enhance the efficiency and convenience of public transportation. The development of this application aims to facilitate public access to transportation information, reduce dependency on private vehicles, and promote the use of more environmentally friendly public transit.

The main benefits of the Trans Jogja application include reducing waiting times, assisting in travel planning, and enhancing the transparency of public services. From the management perspective, the application provides operational data that is valuable for evaluation and decision-making. The technologies employed include GPS for bus tracking, digital maps for route navigation, and a notification system to deliver important information to users. Through this technological integration, the application offers a practical solution for achieving more efficient and organized urban mobility.

3. Research Methods

To conduct this study, a descriptive qualitative method was employed. Descriptive qualitative research is used to explain the conditions or situations under investigation as they are, without altering the data, and is typically carried out through direct interviews with informants [20]. This study aims to clearly describe, identify, and classify data to be systematically processed [21].

In this study, the researcher engaged in direct interaction with informants through interviews and conducted field observations at the research site to observe the phenomena occurring on the ground. In addition, the researcher collected secondary data from various reports, documents, websites, applications, and other sources. All collected data were then analyzed qualitatively through a process of data reduction, which involves filtering relevant information directly related to the research focus. This was followed by data display in the form of descriptive narratives or tables, allowing the researcher to better understand and interpret the gathered information. The final stage involved conclusion drawing and verification, aimed at formulating the research findings objectively based on patterns or themes that emerged during the data analysis process. This step enables the researcher to explain and describe the relationships between variables more clearly.

4. Results and Discussion

Based on insights from an interview with the Head of the Transportation Management Division at PT Anindya Mitra Internasional (AMI) the company tasked with operating the Trans Jogja Bus system in Yogyakarta. PT AMI plays a pivotal role in advancing the city's public transportation network. Historically, Yogyakarta's public transport services were managed by a range of individual operators, including Damri, PO Pemuda, and Aspada. These operators were eventually consolidated into a joint entity known as PT Jogja Tugu Trans (JTT), marking an early step toward a more integrated and organized public transportation system.

To further streamline and professionalize public transit operations, the Governor of the Special Region of Yogyakarta issued Decree No. 384/Kep/2015, which formally appointed PT AMI as the main operator of the Trans Jogja service, working in partnership with PT JTT. Under this cooperative arrangement, the two companies jointly operate a fleet of 128 buses comprising 68 units owned by PT AMI and 60 units owned by PT JTT across multiple transit corridors that serve both urban and suburban areas of Yogyakarta. This collaboration reflects a significant shift toward a centralized, government-regulated public transportation model designed to improve service quality, accessibility, and operational efficiency. Moreover, the structured management under PT AMI has facilitated innovations such as the integration of digital ticketing systems, real-time route tracking, and the gradual introduction of environmentally friendly electric buses. These developments are aligned with the broader vision of transforming Yogyakarta into a smart city, where mobility solutions are data-driven, sustainable, and inclusive. As such, the role of PT AMI extends beyond day-to-day operations it represents a strategic instrument for realizing long-term urban mobility goals in a rapidly urbanizing region.

Transport Route Integration: As part of Yogyakarta's commitment to implementing smart mobility within the broader smart city framework, the Trans Jogja public transportation system has taken significant steps toward multimodal transport integration. One key strategy involves enhancing connectivity between Trans Jogja and other major modes of transportation, such as air and rail travel. Bus routes and stops have been strategically placed in proximity to key transit hubs, including airports and train stations, allowing passengers to transition seamlessly

between modes of travel. This interconnectivity not only improves the overall accessibility of the transport system but also supports greater regional mobility. Further strengthening this integration is the interoperability of payment systems. For example, the Indonesian commuter train multi-trip card commonly used for accessing rail services can also be utilized for Trans Jogja buses. This unified ticketing approach simplifies the user experience and encourages broader adoption of public transport by reducing transactional barriers.

In 2020, Trans Jogja launched a dedicated mobile application, available on both Android and iOS platforms, which marked a major advancement in the digitalization of Yogyakarta's public transportation services. The application provides users with a suite of features designed to improve journey planning and convenience. These include real-time bus tracking, digital route maps, and the ability to make online ticket reservations. Since its initial launch, the app has undergone continuous updates to enhance its functionality and adapt to the evolving needs and expectations of users. This digital innovation reflects the city's broader smart city goals particularly the aim of promoting data driven, user-centric solutions that improve urban mobility. By integrating transportation modes and embracing mobile technology, Trans Jogja is not only modernizing the public transport experience but also contributing to a more efficient, inclusive, and sustainable urban transport ecosystem. In alignment with the principles of inclusivity and equitable urban mobility, Trans Jogja has made deliberate efforts to ensure its services are accessible to all segments of the population, including vulnerable groups. The bus fleet is equipped with disability friendly features such as low floor boarding, designated seating, and clearly marked signage to accommodate passengers with physical limitations. These features underscore the commitment of the system to uphold accessibility as a core component of smart public transport.

To further promote inclusive mobility, PT Anindya Mitra Internasional (AMI), the operator of Trans Jogja, offers a variety of personalized smart cards tailored to different user groups. These include student cards, senior citizen cards, disability cards, and general-use cards. The registration process is designed to be simple and inclusive, requiring only basic personal information and a payment of IDR 50,000 an amount that is fully credited to the user's card balance. The fare structure is intentionally kept affordable, ranging from as low as IDR 60 to IDR 2,700, making it accessible to a broad spectrum of the population, including low-income users. Service enhancement is not limited to infrastructure and ticketing. PT AMI has adopted a proactive approach to community engagement and education. As part of its monthly outreach initiatives, the operator partners with local schools typically reaching two institutions per month to educate students on the benefits and usage of the Trans Jogja system. This early exposure not only fosters public transport literacy among young users but also cultivates a culture of sustainable mobility from an early age.

Moreover, PT AMI maintains ongoing collaborations with local stakeholders, including the Regional House of Representatives (DPRD) and the Yogyakarta City Transportation Agency, to ensure that service improvements are aligned with broader policy goals and community needs. Public information campaigns are disseminated through various channels such as printed brochures, posters, and increasingly through digital platforms like social media, which has become a vital tool in reaching diverse audiences in real time. These multi layered efforts demonstrate how public transportation systems can integrate accessibility, affordability, and community participation into their operational models contributing not only to improved service delivery but also to the realization of an inclusive and people-centered smart city.

Payment Innovation and Operational Efficiency: As part of its commitment to enhancing user experience and operational modernization, Trans Jogja has adopted a range of digital payment innovations aimed at streamlining fare transactions and improving convenience. The system currently supports multiple cashless payment methods, including the use of electronic transportation cards and the national standardized Quick Response Code Indonesian Standard (QRIS). These options not only reduce reliance on cash but also align with broader national efforts to promote a digital economy and financial inclusion. Looking ahead, Trans Jogja's service coverage is planned to expand beyond the urban core into more remote and high demand destinations, particularly in Gunung Kidul Regency an area renowned for its natural tourism attractions. This strategic expansion aims to strengthen regional connectivity, support local economic development through tourism, and reduce traffic congestion in popular travel corridors by offering reliable public transport alternatives.

From an operational standpoint, Trans Jogja maintains a high level of service continuity and punctuality. The buses operate daily from 06:30 to 20:30 Western Indonesian Time (WIB), with an average headway of 15 minutes. This frequency is designed to meet the mobility needs of both commuters and casual travelers, minimizing wait times and ensuring predictable service schedules. To mitigate service interruptions and maintain system reliability, the operator, PT Anindya Mitra Internasional (AMI), has implemented a robust operational support system. This includes the deployment of standby or backup units that can be dispatched in case of vehicle failure, as well as routine and preventive maintenance programs facilitated at dedicated service depots. These measures not only enhance operational efficiency but also contribute to passenger safety and satisfaction. Overall, the integration of digital payment systems, strategic route expansion, and strong operational management positions Trans Jogja as a forward looking public transportation model that supports the vision of a smart, resilient, and user-centric urban mobility system.

The Role of Trans Jogja Buses in Yogyakarta's Development Toward a Smart City: PT Anindya Mitra Internasional (AMI), as the principal operator of the Trans Jogja bus system, plays a critical role in supporting Yogyakarta's transformation into a smart city. This contribution is realized through the continuous integration of advanced technologies, system-wide service improvements, and a strategic shift toward sustainable transportation. By aligning its operations with the core pillars of smart urban development namely smart mobility, environmental sustainability, and digital innovation PT AMI positions Trans Jogja as a model for modern public transport in Indonesia. A key milestone in this transformation is the incorporation of environmentally friendly vehicles, particularly the deployment of electric buses. In 2025, PT AMI initiated a trial electric bus service connecting Adisucipto International Airport with the city's central tourism and commercial hub, Malioboro. This trial is part of a broader initiative to reduce greenhouse gas emissions, improve air quality, and promote the use of clean energy within the city's public transport network. The adoption of electric buses is more than just a technological upgrade; it represents a paradigm shift in urban transportation policy that aligns with global commitments to climate action and sustainable development. In the coming years, the electric bus network is expected to be progressively expanded in accordance with Yogyakarta's urban planning strategies. This expansion will likely include key corridors that experience high passenger demand, particularly routes serving educational institutions, government centers, and tourism hotspots.

Furthermore, the integration of electric vehicles with digital mobility platforms such as real time tracking, e-ticketing, and multimodal route planning demonstrates how smart mobility can be both environmentally responsible and user-centric. PT AMI's role in this process underscores the importance of institutional leadership and innovation in the public sector to realize the full potential of smart city initiatives. Ultimately, the case of Trans Jogja highlights how well-planned public transportation can serve as a catalyst for broader urban transformation, supporting not only sustainable mobility but also social inclusion, economic development, and improved quality of life for residents and visitors alike.

5. Conclusion

The implementation of the Trans Jogja application as part of the smart city initiative in Yogyakarta has demonstrated significant improvements in public transportation services managed by PT Anindya Mitra Internasional (AMI), particularly in terms of accessibility, efficiency, and service quality. As an embodiment of smart mobility, the application offers real-time information, reduces waiting times, and facilitates more efficient daily travel planning. The integration of Trans Jogja with other transportation modes, such as commuter trains and air travel, along with the use of digital payments and electric buses, reflects the city's commitment to sustainability and technological advancement. Despite these achievements, challenges persist, including underutilized routes, discrepancies in estimated travel times, and the need for improved bus stop infrastructure. Nonetheless, increasing public interest in the application indicates a behavioral shift from private to public, tech-based transportation. To further enhance smart mobility, it is recommended to improve system accuracy, expand route coverage especially to tourism and education hubs enhance collaboration among stakeholders, and intensify public outreach and education to promote widespread adoption of the service and support Yogyakarta's evolution into a more efficient, sustainable, and user-friendly smart city.

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