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Jeepney Operators' Benefits and Challenges in Transitioning to Modernization under the Public Utility Vehicle Modernization Program in Dasmariñas, Cavite

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Abstract
The Public Utility Vehicle Modernization Program (PUVMP), launched by the Philippine government in 2017, aims to phase out traditional jeepneys and replace them with modern, eco-friendly alternatives. This study investigates the multifaceted experiences of jeepney operators and driver-operators in Dasmariñas City, Cavite, as they navigate the complex transition brought about by the PUVMP. Utilizing a descriptive-comparative research design and non-probability purposive sampling, quantitative data were gathered from 100 respondents to assess both the challenges and perceived benefits of modernization. Key areas of focus included financial constraints, technological adaptation, and regulatory compliance, alongside perceived improvements in economic opportunities, environmental impact, and social equity. The findings indicate that while jeepney operators encountered the modernization process as significantly challenging, they also recognized considerable benefits brought about by the program. Furthermore, the study examined whether demographic factors influenced these perceptions. Through the use of Analysis of Variance (ANOVA), results revealed that most demographic variables did not show statistically significant differences regarding perceived challenges and benefits. These insights offer valuable implications for policymakers, particularly in refining and implementing inclusive transport modernization strategies.

Keywords: Public Utility Vehicle Modernization Program, Jeepney Operators, Modernization Challenges, Modernization Benefit

1. Introduction

Public transportation is essential for millions of Filipinos, particularly in urban and rural areas where affordable transport options are vital for commuting to work, school, and other daily activities. Among various modes of transport, the jeepney is particularly significant, both culturally and functionally, as it remains a popular and economical choice for many. Known for its cost-effectiveness and reliability, the jeepney has long served as a cornerstone of public transport in the Philippines. However, increasing

environmental concerns and pressures of urbanization have prompted the need for modernization, including the traditional jeepney, to align with international environmental standards and promote sustainability (Guno et al., 2021).

In response to these needs, the government of the Philippines launched the Public Utility Vehicle Modernization Program (PUVMP) in 2017. The objective of this project is to replace old jeepneys with modern and more eco-friendly models. It aims to improve the reliability, efficiency, and safety of the public transit system. Traditional jeepneys have been shown to significantly contribute to urban air pollution, responsible for 94% of soot emissions in Metro Manila despite representing a small portion of the vehicle fleet. The high levels of emissions from these vehicles have critical implications for public health and environmental integrity, making the modernization of the jeepney fleet an urgent necessity. Despite the PUVMP's overarching environmental and social goals, the transition has presented considerable financial and operational hurdles for jeepney operators, many of whom belong to low-income demographics. The price of modern jeepneys ranges from PHP 1.4 million to PHP 2.8 million, a stark contrast to the traditional models, which cost between PHP 200,000 and PHP 600,000 (Manticajon, 2023). Although government subsidies have increased, they fall short of covering the full cost of modernization, leaving operators with a substantial financial burden. Furthermore, operators face the challenge of adapting to new technologies and complying with stricter regulations—an adjustment that often demands significant time, training, and resources (Mateo-Babiano et al., 2020). This financial pressure and operational shift have raised concerns among operators regarding the potential for business closures and a significant reduction in income.

While the modernization initiative offers long-term benefits such as improved service quality, lower emissions, and better commuter satisfaction, these benefits depend on effectively addressing financial, regulatory, and technological challenges. Government support, including infrastructure development is essential for the successful implementation of the Public Utility Vehicle Modernization Program (PUVMP) (Agaton et al., 2020). This study focuses on identifying the key challenges and benefits experienced by jeepney operators and analyzing how these vary across demographic factors such as age, experience, duration since transition, sex, and years of operation.

This study centers on jeepney operators who have transitioned under the Public Utility Vehicle Modernization Program (PUVMP), aiming to investigate the significant differences in the challenges and benefits they experience according to their demographic profiles. By exploring these differences, the research seeks to offer valuable insights that can inform policymakers in providing targeted support during the transition. The findings are expected to contribute to a sustainable and equitable public transportation reform that meets modernization goals while safeguarding the livelihoods of operators. The transition challenges are shaped by multiple factors, including financial constraints, government regulations, and the need to adapt to new technologies. Similar barriers have been documented in previous studies on electric vehicle adoption in the Philippines, highlighting the relevance of these issues to jeepney operators under the PUVMP. Ultimately, this study aims to generate evidence-based policy recommendations to ease financial and operational burdens, facilitate a smoother transition, and ensure the long-term sustainability of jeepney operators in Dasmariñas and potentially in other regions.

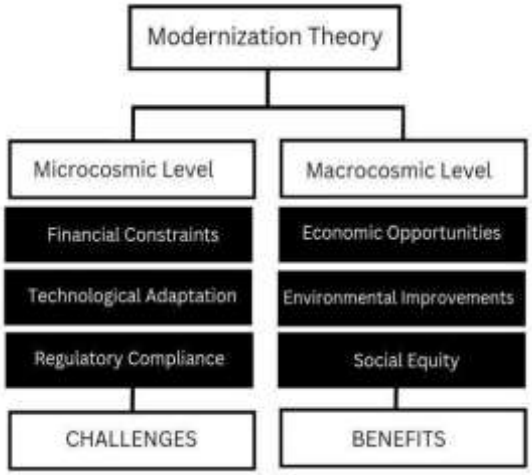
1.1 Theoretical Framework

The theoretical framework used in this study is based on Modernization Theory, particularly the version articulated by proponents such as Rostow (1960) and Inglehart (1997). This framework serves as a foundational lens for understanding the complexities of transitioning to modernized public transport

systems. This study aims to analyze how modernization can benefit the country's transportation system. It is based on the work of Bénichou (2024), who studies how transport infrastructure can be developed within the national economy, focusing on how social equity, economic growth, and environmental responsibility intersect. Conversely, the challenges faced by jeepney operators during this transition are examined through microcosmic factors, informed by Guno, Collera, and Agaton (2021), who discuss the barriers and drivers related to the adoption of electric vehicles (EVs) in the Philippines, highlighting challenges such as financial constraints, adaptation to emerging technologies, and evolving regulatory standards.

Consolidating these studies is essential for developing a comprehensive theoretical framework that addresses both the broader societal implications of transportation modernization and the specific challenges encountered by operators in adapting to new technologies and regulations. By integrating insights from both macrocosmic and microcosmic perspectives, this study aims to provide a nuanced understanding of the transition process, thereby informing policymakers and stakeholders about effective strategies for implementing the Public Utility Vehicle Modernization Program (PUVMP).

Figure 1: Integrating Macro and Micro Perspectives on Public Utility Vehicle Modernization



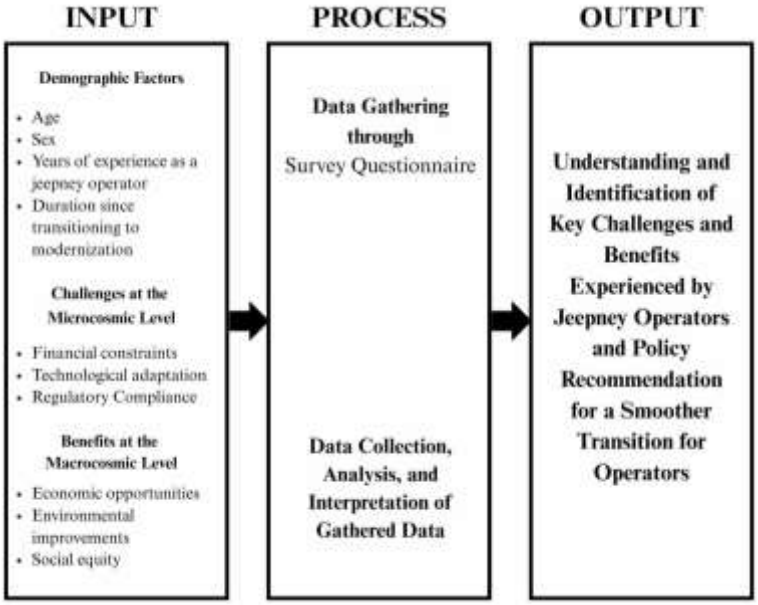
1.2 Conceptual Framework

The Input-Process-Output (IPO) served as a conceptual framework for analyzing the challenges and benefits experienced by jeepney operators. In this framework, the input phase encompasses demographic factors including age, sex, years of experience as a jeepney operator, and the duration since transitioning to modernization. Additionally, the input includes challenges at the microcosmic level, which include financial constraints, technological adaptation, and regulatory compliance. Lastly, there are benefits at the macrocosmic level, such as economic opportunities, environmental improvements, and social equity.

The process phase consists of data gathering through a survey questionnaire designed to collect relevant information from jeepney operators, followed by analysis and interpretation of the data to identify trends and significant differences in the challenges and benefits when compared in accordance with the profile of jeepney operators under the PUVMP.

The output phase provides an understanding and identification of key challenges and benefits experienced by jeepney operators. This understanding is intended to serve as a foundation for developing policy recommendations aimed at facilitating a smoother transition for operators.

Figure 2: Conceptual Framework of the Study



1.3 Statement of the Problem

This study investigates the benefits and challenges experienced by jeepney operations as they transition to modernization under the Public Utility Vehicle Modernization Program (PUVMP) in Dasmariñas, Cavite. Guided by the Modernization Theory framework, the study aims to generate insights that will lead to targeted policy recommendations to facilitate a smoother transition for operators and improve the overall public transportation system. Specifically, this study aims to answer the following questions:

1.3.1. What is the demographic profile of the participants in terms of:
1.3.1.1. age,
1.3.1.2. sex,
1.3.1.3. years of experience as a jeepney operator, and
1.3.1.4. duration of their transition to modernization?
1.3.2. What challenges do jeepney operators face after transitioning to modernization in terms of:
1.3.2.1. financial constraints,
1.3.2.2. technological adaptation, and
1.3.2.3. regulatory compliance?
1.3.3. What benefits do jeepney operators experience after transitioning to modernization in terms of societal factors, including:
1.3.3.1. economic opportunities,
1.3.3.2. environmental improvements, and
1.3.3.3. social equity?
1.3.4. Is there a significant difference in the challenges and benefits when compared in accordance with the profile of jeepney operators under the PUVMP?
1.3.5. What policy recommendations can be made based on the study's findings to address the identified challenges and improve outcomes?

1.4 Hypothesis

The following hypotheses below were formulated to be tested at a significance level of 0.05.

$H0_1$: There is no significant difference between the profile of jeepney operators and the challenges they face following the shift to modernization.

$H0_2$: There is no significant difference between the profile of jeepney operators and the benefits they experience following the shift to modernization.

1.5 Scope and Limitation of the Study

This study focuses on examining the challenges and benefits experienced by jeepney operators in Dasmariñas City, Cavite, as they transition to modernization under the Public Utility Vehicle Modernization Program (PUVMP). Launched in 2017, the program seeks to modernize public transportation by replacing traditional jeepneys with eco-friendly vehicles, enhancing service quality, and reinforcing compliance with regulatory requirements. However, the program has faced delays and opposition due to financial and logistical challenges. In the Philippine Congress, debates on the modernization program remain ongoing, with various legislative measures and proposals under review to address the concerns of affected stakeholders, including financial subsidies, loan programs, and deadlines for implementation.

The study focuses specifically on jeepney operators because they are responsible for critical decision-making processes, including securing financing, purchasing modernized units, and ensuring regulatory compliance. Drivers, while integral to daily operations, are excluded to concentrate on the operators' managerial and financial challenges, which are central to the modernization process.

Drivers are deliberately excluded from the study because their role in the modernization process is primarily operational rather than managerial. While drivers play a crucial part in daily transportation services, the study aims to concentrate on operators, who are directly involved in financial planning, technological adaptation, and regulatory compliance—key aspects of the PUVMP. Dasmariñas City, Cavite, was selected as the study's locale because the city's role as a transportation hub makes it an ideal location for analyzing the practical challenges and benefits associated with the PUVMP. Focusing on this specific area ensures the study remains feasible while providing insights that may be applicable to similar urban settings across the country.

The study also aims to align its outcomes with actionable policy recommendations. By analyzing the challenges faced by operators and their perspectives on the modernization program, the research will propose strategies to improve the implementation of the PUVMP. These recommendations will address financial support mechanisms, streamlined regulatory processes, and equitable access to modernization resources, contributing to the ongoing legislative discussions in Congress.

Additionally, the research will take place over a nine-month period, from September 2024 to May 2025, to thoroughly assess the operators' experiences and examine the connection between the challenges they encounter and the benefits they experience during this transitional phase.

2. Methodology

This study employed a descriptive-comparative research design to examine the challenges and benefits experienced by jeepney operators who have transitioned under the Public Utility Vehicle Modernization Program (PUVMP). Descriptive research, as defined by Creswell and Creswell (2023), involves the systematic collection of data to accurately represent people, situations, or events. In this study, it was used to portray the lived experiences of operators, while the comparative aspect helped identify differences in their experiences based on demographic profiles. These profiles included age, sex, years of experience as an operator, and the duration since transitioning to modernization. The comparative method, according to

Pennings and Keman (2023), provides a framework for analyzing differences between cases using theoretical and empirical data, which is essential in understanding the varying outcomes of the modernization process.

To select appropriate respondents, the study used non-probability sampling techniques, particularly purposive and snowball sampling. Purposive sampling was applied to identify jeepney operators who had direct experience with the modernization process, which allowed for more relevant and informed responses (Campbell et al., 2020). Snowball sampling was then used to expand the participant pool by asking initial respondents to recommend others with similar experiences, a method useful for accessing specialized groups (Nikolopoulou, 2022). The research was conducted in Dasmariñas City, Cavite, an urban area significantly affected by transportation reforms. Out of 16 registered cooperatives, only two were found to be actively operating modernized jeepneys: Dasmariñas One Pasada Transport Cooperative and Bicolano Jeepney Operators. From these, 100 jeepney operators and driver-operators were selected, ensuring that participants had at least one year of relevant experience and met other criteria related to citizenship and age.

The researchers used a self-developed survey questionnaire as the primary data collection tool. The questionnaire was structured into three parts: the first section gathered demographic data; the second addressed challenges such as financial constraints, technological adaptation, and regulatory compliance, based on the framework by Guno, Collera, and Agaton (2021); and the third explored benefits including economic opportunities, environmental improvements, and social equity, guided by the framework of Bénichou (2024). A four-point Likert scale was used to measure responses. For data analysis, frequency and percentage were used to describe the participant profiles, while mean and standard deviation summarized the levels of challenges and benefits. To determine if there were significant differences across demographic groups, the researchers applied One-Way Analysis of Variance (ANOVA), a statistical method suitable for comparing means among multiple groups (Brown and Breslin, 2020). This approach allowed the study to generate meaningful insights into how different operators experience the modernization program.

3. Results and Discussion

Table 1: Frequency Distribution for the Age of Selected Jeepney Operators

Age	Frequency	Percentage
Below 25	0	0.0%
25-34	3	3.00%
35-44	27	27.00%
45-54	41	41.00%
55-64	29	29.00%
Above 65	0	0.0%
Total	100	100.00%

The frequency distribution of respondents' ages, as presented in Table 1, reveals that the largest proportion falls within the 45–54 age bracket, comprising 41.00% of the total sample. This is followed by individuals aged 55–64, who represent 29.00% of respondents. The 35–44 age group accounts for 27.00%, while those below 35 years old constitute the smallest segment at 3.00%. This distribution indicates that the majority of respondents are within the mid-to-late career age range.

This finding is consistent with the study of Biona (2023), which reported that approximately 60% of jeepney operators in the Philippines fall within the late 30s to late 50s age range. Such data reflects a common demographic trend within the sector, where middle-aged individuals continue to dominate the workforce, likely due to the experience and stability associated with this stage in life.

Table 2: Frequency Distribution for the Sex of Selected Jeepney Operators

Sex	Frequency	Percentage
Male	61	61.00%
Female	39	39.00%
Total	100	100.00%

As presented in Table 2, the distribution of respondents by sex shows a moderate disparity, with males comprising 61.00% and females accounting for 39.00% of the surveyed jeepney operators. While the male population remains higher, the presence of a considerable proportion of female operators indicates a degree of gender participation that slightly diverges from the traditionally male-dominated image of the industry. This trend is noteworthy considering the Freedom of Information (FOI) Report on Gender Statistics of PUV Drivers and Operators (2023), which identifies women as a small minority in the national jeepney operator workforce. Although the findings of this study reflect a smaller gender gap compared to national-level data, they still align with broader patterns indicating male predominance in the sector.

Table 3: Frequency Distribution for Length of Service of Selected Jeepney Operators

Length of Being a Jeepney Operator (years)	Frequency	Percentage
Less than 1	2	2.00%
1-5	12	12.00%
6-10	23	23.00%
11-15	25	25.00%
16-20	20	20.00%
More than 20	18	18.0%
Total	100	100.00%

As shown in Table 3, most respondents have been operating as jeepney drivers for 11–15 years (25.00%), followed by those with 6–10 years (23.00%), 16–20 years (20.00%), and more than 30 years (18.00%). Meanwhile, 12.00% have been in service for 1–5 years, and only 2.00% have less than a year of experience. This distribution suggests that many jeepney operators have remained in the profession for extended periods. According to Baltazar et al. (2024), despite financial and operational challenges, many drivers continue operating due to the fulfillment they find in serving the public and the role jeepneys play as a stable source of livelihood.

Table 4: Frequency Distribution for Length of Transition to Modernization

Length of Transitioning to Jeepney Modernization (years)	Frequency	Percentage
Less than 1	43	43.00%
1-3	38	38.00%

Length of Transitioning to Jeepney Modernization (years)	Frequency	Percentage
4-5	15	15.00%
More than 5	4	4.00%
Total	100	100.00%

As shown in Table 4, most respondents have only recently begun transitioning to the Jeepney Modernization Program, with 43.00% reporting less than 1 year, 38.00% with 1–3 years, 15.00% with 4–5 years, and only 4.00% having transitioned for more than 5 years. This suggests that the shift toward modernization is still relatively recent among many operators. According to Landayan et al. (2024), economic constraints, lack of government support, and fears of job loss have delayed the transition, even though many drivers support the program in principle.

Table 5: Descriptive Statistics for Financial Challenges Faced by Jeepney Operators

Financial Constraints	Mean	SD	Remarks	Verbal Interpretation
1. I find the purchase costs of modernizing vehicles are too high.	3.63	0.61	Strongly Agree	Highly Challenging
2. It was hard to find sufficient financial support to cover modernization costs.	3.39	0.69	Strongly Agree	Highly Challenging
3. I have experienced a significant increase in operational costs after modernization.	3.43	0.72	Strongly Agree	Highly Challenging
4. I find maintaining new vehicles financially challenging.	3.45	0.79	Strongly Agree	Highly Challenging
5. I find the interest rates on loans for modernization too high.	3.50	0.68	Strongly Agree	Highly Challenging
Grand Mean/Subtotal	3.48	0.70	Strongly Agree	Highly Challenging

Note: Strongly Agree (3.25-4.00); Agree (2.50-3.24); Disagree (1.75-2.49); Strongly Disagree (1.00-1.74)

As shown in Table 5, financial constraints emerged as the most significant challenge faced by jeepney operators in Dasmariñas, Cavite, during their transition to the Public Utility Vehicle Modernization Program (PUVMP), with a grand mean score of 3.48 (SD = 0.70), interpreted as "Strongly Agree." Notably, the highest-rated statement was, "I find the purchase costs of modernizing vehicles are too high" (M = 3.63, SD = 0.61), while the lowest-rated was, "It was hard finding sufficient financial support to cover modernization costs" (M = 3.39, SD = 0.69), both still within the "Strongly Agree" range.

The highest mean score reflects the overwhelming concern among jeepney operators regarding the expensive initial cost of acquiring modern jeepneys. With prices ranging from ₱1.6 million to ₱2.5 million per unit, affordability remains the most pressing financial constraint. This is particularly burdensome for small-scale operators who rely on daily income and cannot easily afford such high costs. These findings align with Mendoza (2021), who highlighted that the steep price disparity between traditional jeepneys

(₱200,000–₱400,000) and modern units raises serious concerns about the ability of many small operators to comply with the modernization mandate, potentially forcing them out of the market.

Meanwhile, the slightly lower score for difficulty in finding sufficient financial support suggests that while government assistance programs exist, many operators struggle to access them. Rigorous lending standards, cooperative consolidation requirements, and complex procedural hurdles limit the ability of small operators to benefit fully from available subsidies and loans. Monthly amortizations, which can reach up to ₱475,000 for cooperatives operating multiple units, not including fuel, repairs, and crew costs-add to the financial burden. Although loan interest rates are fixed at around 6%, the large principal amounts and extended repayment terms often trap operators in a cycle of debt. Roces (2023) emphasized that this debt burden jeopardizes financial stability and discourages many operators from transitioning.

The overall interpretation of the grand mean of 3.48 indicates a strong consensus among jeepney operators that financial constraints significantly hinder their successful transition to the PUVMP. While the program's goals are beneficial in theory, the high costs and limited access to affordable financing threaten to exclude many small operators, potentially pushing them out of the industry. These findings are consistent with Mendoza (2021), who reported that modern jeepney prices start at approximately ₱1.6 million per unit and can increase to about ₱2.5 million per unit, creating a substantial financial burden for small-scale operators who rely on daily income for their livelihood. This cost disparity makes modernization inaccessible for a large segment of traditional operators. Roces (2023) further notes that when combined with large loan principals, monthly amortizations, and auxiliary expenses, operators become trapped in a debt cycle that jeopardizes their financial stability and discourages others from transitioning.

Table 6: Descriptive Statistics for Technological Challenges Faced by Jeepney Operators

Technological Adaptation	Mean	SD	Remarks	Verbal Interpretation
1. It is not easy to learn and adapt to the new technologies being utilized in modernized jeepneys.	2.28	0.83	Disagree	Somewhat Not Challenging
2. There's not enough training to understand and operate the new technologies in modernized jeepneys.	2.17	0.88	Disagree	Somewhat Not Challenging
3. I often experience engine failures and air conditioning problems in modernized jeepneys.	2.01	0.92	Disagree	Somewhat Not Challenging
4. The technology in modernized jeepneys requires upgrades that I cannot easily implement.	1.99	0.90	Disagree	Somewhat Not Challenging
5. I don't fully trust the new technologies in modernized jeepneys to perform well daily.	2.04	0.95	Disagree	Somewhat Not Challenging
Grand Mean/Subtotal	2.10	0.90	Disagree	Highly Challenging

Note: Strongly Agree (3.25-4.00); Agree (2.50-3.24); Disagree (1.75-2.49); Strongly Disagree (1.00-1.74)

As shown in Table 6, technological adaptation is generally not perceived as a major barrier by jeepney operators in Dasmariñas, Cavite, in their transition under the Public Utility Vehicle Modernization Program (PUVMP). The grand mean score of 2.10 (SD = 0.90) corresponds to a "Disagree" interpretation, indicating that operators largely do not consider adapting to new technologies difficult. The highest-rated statement was, "It is not easy to learn and adapt to the new technologies being utilized in modernized jeepneys" (M = 2.28, SD = 0.83), while the lowest-rated was, "The technology in modernized jeepneys requires upgrades that I cannot easily implement" (M = 1.99, SD = 0.90), both falling within the "Disagree" range.

The relatively higher mean for the learning and adaptation item suggests that although a few operators may experience minor apprehensions or initial challenges-particularly with components such as cashless fare systems, GPS tracking, or engine diagnostics majority find adapting to these technologies manageable. This is likely due to years of hands-on experience in public transport operations, informal peer learning, and basic instructional support that ease the transition even without formal technical training. This observation aligns with Base et al. (2024), who found that the learning curve for new transport technologies in the Philippines is not a significant deterrent, as operators rely heavily on peer support and practical experience.

Conversely, the lowest mean score reflects a strong disagreement with the notion that technological upgrades are difficult to implement. Operators appear confident in their ability to manage necessary updates, possibly because the current technology does not require frequent or complex upgrades, or because any required modifications are within their capacity to handle. This finding supports Biona et al. (2023), who emphasized that technological challenges are less likely to hinder modernization compared to economic or regulatory constraints. Operators tend to be more limited by systemic issues such as financing and compliance rather than by the technical demands of modernization.

Overall, the grand mean of 2.10 reinforces that technological adaptation is not seen as a major challenge by jeepney operators. Compared to pressing issues like financial constraints and regulatory compliance, technology-related difficulties are relatively minor. The consistent response pattern, indicated by low standard deviations, further supports this conclusion. Operators' pragmatic focus on economic viability over technological hurdles reflects a realistic prioritization of challenges. These insights suggest that efforts to support PUVMP implementation should prioritize alleviating financial and policy barriers rather than investing heavily in overcoming technological resistance, which appears manageable for most operators. This perspective is supported by studies highlighting that the primary challenges to PUVMP compliance lie in economic and regulatory factors rather than technology adoption (Base et al., 2024; Biona et al., 2023). Moreover, the availability of peer learning, informal training, and hands-on experience facilitates operators' adaptation to new technologies, reducing resistance and easing the transition process. As a result, stakeholders may focus resources on addressing financial burdens and compliance issues, which remain the most significant obstacles to full modernization.

Table 7: Descriptive Statistics for Regulatory Challenges Faced by Jeepney Operators

Regulatory Compliance	Mean	SD	Remarks	Verbal Interpretation
1. I find the new regulations under the PUVMP (Public Utility Vehicle Modernization Program) difficult to understand and follow.	2.59	0.84	Agree	Somewhat Challenging
2. It is too much of a hassle to meet the	2.67	0.86	Agree	Somewhat Challenging

Regulatory Compliance	Mean	SD	Remarks	Verbal Interpretation
regulatory requirements for modernizing my jeepney.				
3. Complying with environmental standards for modern jeepneys is challenging due to strict regulations.	2.42	1.01	Agree	Somewhat Challenging
4. I feel that the government's website for regulatory compliance is difficult to navigate.	2.89	0.92	Agree	Somewhat Challenging
5. I find it difficult to keep up with the frequent changes in jeepney modernization regulations.	2.69	1.00	Agree	Somewhat Challenging
Grand Mean/Subtotal	2.65	0.92	Agree	Somewhat Challenging

Note: Strongly Agree (3.25-4.00); Agree (2.50-3.24); Disagree (1.75-2.49); Strongly Disagree (1.00-1.74)

As presented in Table 7, regulatory compliance was identified as the second most significant challenge faced by jeepney operators in Dasmariñas, Cavite, during their transition to the Public Utility Vehicle Modernization Program (PUVMP), with a grand mean score of 2.65 (SD = 0.92), interpreted as "Agree." This indicates a general consensus that regulatory compliance poses a moderate challenge. The highest-rated statement was, "I feel that the government's website for regulatory compliance is difficult to navigate" (M = 2.89, SD = 0.92), while the lowest-rated was, "Complying with environmental standards for modern jeepneys is challenging due to strict regulations" (M = 2.42, SD = 1.01), both falling within the "Agree" range.

The highest mean score highlights the significant challenge operators face with digital accessibility. Many jeepney drivers and operators, particularly older individuals or those with limited digital literacy, find it difficult to navigate government websites for regulatory compliance, such as updating requirements or submitting necessary documents. This digital barrier often results in delayed submissions and increased errors, thereby complicating compliance processes rather than facilitating them. This finding aligns with Biona et al. (2023), who emphasized that the lack of user-friendly digital platforms and clear regulatory communication hampers operators' ability to comply effectively with regulations.

In contrast, the lowest mean score indicates that while operators agree that environmental standards are strict, they perceive compliance with these standards as less challenging compared to administrative or digital hurdles. Many operators recognize the legitimacy and necessity of environmental reforms, viewing them as essential investments for the long-term sustainability of public transportation. This perception is supported by Estipular (2020), who noted that operators are more likely to accept reforms that are clearly communicated and aligned with public welfare goals, such as environmental protection. The relatively lower concern over environmental compliance suggests that these regulations are better understood or more consistently enforced than other procedural requirements.

The overall grand mean score of 2.65 reflects that regulatory compliance imposes a moderate burden on jeepney operators. While not as pressing as financial constraints, regulatory requirements add complexity and stress to the modernization process. Operators must navigate not only financial demands but also evolving and sometimes confusing rules and procedures. This complexity is exacerbated by inconsistent government communication and the lack of streamlined digital tools, as highlighted by Biona et al. (2023). Estipular (2020) further points out that simultaneous reforms-including vehicle standards, cooperative

consolidation, and franchise updates-contribute to stakeholder confusion and compliance difficulties. These findings underscore the need for improved regulatory frameworks that incorporate user-friendly digital platforms, clearer communication, and capacity-building initiatives to support operators, especially those less familiar with digital technologies. Addressing these challenges is critical to ensuring smoother compliance and greater acceptance of the PUVMP among jeepney operators, thereby facilitating a more effective and inclusive modernization process.

Table 8: Descriptive Statistics for Economic Benefits Experienced by Jeepney Operators

Economic Opportunities	Mean	SD	Remarks	Verbal Interpretation
1. I believe jeepney modernization has boosted local economic activity by improving transportation efficiency and reliability.	3.33	0.65	Strongly Agree	Highly Beneficial
2. I think jeepney modernization has created new job opportunities in the local transport sector.	3.32	0.69	Strongly Agree	Highly Beneficial
3. I believe jeepney modernization has attracted more customers to nearby businesses by improving transportation options.	3.30	0.74	Strongly Agree	Highly Beneficial
4. I believe that jeepney modernization has created business opportunities in related sectors, such as vulcanizing shops and hardware stores.	3.20	0.69	Agree	Somewhat Beneficial
5. I feel that modernizing my jeepney gave me a competitive advantage in the public transport sector.	3.41	0.71	Strongly Agree	Highly Beneficial
Grand Mean/Subtotal	3.31	0.70	Strongly Agree	Highly Beneficial

Note: Strongly Agree (3.25-4.00); Agree (2.50-3.24); Disagree (1.75-2.49); Strongly Disagree (1.00-1.74)

As shown in Table 8, economic opportunities emerged as the most significant benefit experienced by jeepney drivers and operators following their transition to the Public Utility Vehicle Modernization Program (PUVMP), with a grand mean score of 3.31 (SD = 0.70), interpreted as "Strongly Agree." This indicates a strong consensus among respondents in Dasmariñas, Cavite, that modernization has brought considerable economic advantages. The highest-rated statement was, "I feel that modernizing my jeepney gave me competitive advantage in the public transport sector" (M = 3.41, SD = 0.71), while the lowest-rated was, "I believe that jeepney modernization has created business opportunities in related sectors, such as vulcanizing shops and hardware stores" (M = 3.20, SD = 0.69), both within the "Agree" range.

The lowest-rated item, although still positively viewed, suggests that indirect economic benefits in ancillary industries such as vulcanizing shops and hardware stores are less strongly felt by operators. This indicates that while modernization may increase demand for related services through higher maintenance and parts replacement needs, these opportunities are not yet perceived as major economic drivers by most

respondents. Factors such as geographic location, the level of program implementation, and awareness of supply chain changes may influence this perception. This aligns with Cruz (2020), who noted that the PUVMP primarily focuses on improving the transport system and directly assisting operators, rather than promoting growth in ancillary business sectors. The moderate agreement on this item reflects that such indirect business prospects exist but have not yet become prominent during the early phases of modernization.

Conversely, the highest-rated item reflects a strong belief that modernization provides operators with a competitive advantage in the public transport sector. Improved vehicle reliability, aesthetics, and passenger comfort attract more riders, translating into increased revenue and enhanced customer satisfaction. The introduction of fleet management systems and route optimization further strengthens competitiveness by reducing operational inefficiencies. Respondents' agreement with this statement supports Claudio (2021), who emphasized that the PUVMP aims to professionalize and standardize public transportation, fostering a more competitive and stable operating environment. The program's cooperative model and fleet improvements help operators meet passenger expectations and align with national transport goals, enhancing their market position.

Overall, the grand mean of 3.31 ("Strongly Agree") indicates that economic opportunities are the most positively perceived benefit of the PUVMP among jeepney operators in Dasmariñas, Cavite. Operators associate modernization with job creation, improved earnings, and expanded business opportunities. They also recognize emerging ripple effects in maintenance, operations, and allied sectors, though these have yet to reach full potential. Improved transport efficiency contributes to faster travel times and better commuter experiences, indirectly benefiting the local economy. These findings are supported by Francesquite and Calva (2024), who highlighted that the PUVMP stimulates job creation across manufacturing, maintenance, and operations, while promoting local industry through the use of assembled vehicles. Route rationalization further enhances economic benefits by reducing congestion and travel times, increasing productivity for operators and commuters alike.

Table 9: Descriptive Statistics for Environmental Benefits Experienced by Jeepney Operators

Environmental Improvements	Mean	SD	Remarks	Verbal Interpretation
1. I use less fuel compared to my old jeepney.	2.97	0.81	Agree	Somewhat Beneficial
2. I no longer contribute to black smoke emissions like older jeepneys do.	3.44	0.68	Strongly Agree	Highly Beneficial
3. I notice that my engine runs smoothly without producing too much noise.	3.42	0.67	Strongly Agree	Highly Beneficial
4. I notice that roads are cleaner with fewer oil leaks from modernized jeepneys.	3.32	0.66	Strongly Agree	Highly Beneficial
5. I notice that my jeepney does not produce a strong fuel smell like older models.	3.35	0.67	Strongly Agree	Highly Beneficial
Grand Mean/Subtotal	3.30	0.70	Strongly Agree	Highly Beneficial

Note: Strongly Agree (3.25-4.00); Agree (2.50-3.24); Disagree (1.75-2.49); Strongly Disagree (1.00-1.74)

As presented in Table 9, environmental improvements ranked as the second most significant benefit perceived by jeepney drivers and operators following their transition to the Public Utility Vehicle Modernization Program (PUVMP), with a grand mean score of 3.30 (SD = 0.70), corresponding to a "Strongly Agree" interpretation. Notably, the highest-rated statement was, "I no longer contribute to black smoke emissions like older jeepneys do" (M = 3.44, SD = 0.68), while the lowest-rated was, "I use less fuel compared to my old jeepney" (M = 2.97, SD = 0.81), which still falls within the "Agree" range.

The relatively lower score for fuel efficiency indicates that while operators generally agree that they use less fuel than before, this benefit is less uniformly experienced compared to other environmental improvements. Perceptions of fuel savings vary depending on the type of vehicle-diesel, hybrid, or electric-and the nature of daily operations. For example, operators driving electric units may notice significant fuel cost reductions, whereas those using heavier or air-conditioned diesel models might not perceive substantial improvements. This variation also reflects factors such as maintenance practices, traffic conditions, and vehicle specifications. These findings align with Cruz (2020), who noted that the PUVMP primarily focuses on reducing emissions and reforming the transport system rather than guaranteeing fuel savings. Fuel efficiency outcomes are thus context-dependent and may improve over time as operators adapt to new technologies.

In contrast, the highest-rated item highlights a strong perception of reduced air pollution, particularly the elimination of visible black smoke emissions associated with older jeepneys. The adoption of Euro IV-compliant engines and electric units has led to cleaner combustion, significantly reducing particulate emissions. Respondents view this as a major environmental achievement, contributing not only to regulatory compliance but also to improved public health and community well-being through cleaner roadside air. This perception is supported by de Guinto et al. (2024), who reported that Euro IV engine adoption in Trece Martires City, Cavite, resulted in an 84.3% reduction in carbon monoxide (CO), an 83.4% decrease in particulate matter (PM2.5), and a 21.8% drop in nitrogen oxides (NOx). These measurable improvements confirm that operators' experiences reflect real environmental benefits.

Overall, the grand mean of 3.30 ("Strongly Agree") confirms that environmental improvements are among the most positively perceived outcomes of the PUVMP by jeepney operators in Cavite. Respondents consistently noted reduced emissions, quieter and cleaner vehicle operations, and fewer oil leaks, all contributing to a more sustainable and health-conscious transport system. They also acknowledged that modernized jeepneys help maintain cleaner streets and healthier surroundings, with reduced fuel odors and noise enhancing urban living conditions. These findings reflect a growing environmental awareness among operators, especially newer entrants who may be more receptive to green initiatives. This aligns with de Guinto et al. (2024), who emphasized the crucial role of integrating clean technologies into public transport to advance both national and local environmental goals. By promoting sustainable transport practices, the PUVMP fosters a culture of ecological accountability within the public transport sector, paving the way for long-term environmental and public health benefits.

Table 10: Descriptive Statistics for Social Benefits Experienced by Jeepney Operators

Social Equity	Mean	SD	Remarks	Verbal Interpretation
1. I think the modernized jeepneys have made public transport more accessible for seniors and PWDs.	3.05	0.82	Agree	Somewhat Beneficial

2. I feel that the modernization program helps ensure safer trips for mothers, students, and young passengers.	3.12	0.78	Agree	Somewhat Beneficial
3. I believe the jeepney modernization program helps ensure that operators from all backgrounds have equal access to government support and incentives.	2.86	0.93	Agree	Somewhat Beneficial
4. The government ensures fairness in modernization by requiring small operators to join cooperatives for better support.	2.93	0.78	Agree	Somewhat Beneficial
5. I believe the modernization of jeepneys has helped improve the safety and reliability of public transportation for passengers from all social classes.	3.09	0.75	Agree	Somewhat Beneficial
Grand Mean/ Subtotal	3.01	0.81	Agree	Somewhat Beneficial

Note: Strongly Agree (3.25-4.00); Agree (2.50-3.24); Disagree (1.75-2.49); Strongly Disagree (1.00-1.74)

As presented in Table 10, social equity emerged as a significant benefit perceived by jeepney drivers and operators following their transition to the Public Utility Vehicle Modernization Program (PUVMP). The overall grand mean of 3.01 (SD = 0.81) indicates general agreement that the program promotes social equity. Notably, the lowest-rated statement was, "I believe the jeepney modernization program helps ensure that operators from all backgrounds have equal access to government support and incentives" (M = 2.86, SD = 0.93), while the highest-rated statement was, "I believe the modernization of jeepneys has helped improve the safety and reliability of public transportation for passengers from all social classes" (M = 3.12, SD = 0.78).

The relatively lower score for equitable access to government support reveals a weaker consensus among respondents, particularly operators, about the fairness of program benefits. Smaller or independent operators often perceive disadvantages compared to those affiliated with larger cooperatives. Challenges such as navigating loan applications, meeting program requirements, and understanding procedures disproportionately affect operators with limited resources or organizational support. These concerns align with Zulueta et al. (2024), who noted that while modernization improves environmental and commuter outcomes, systemic inequities persist-especially in the distribution of government aid and access to support services for smaller players in the sector.

In contrast, the highest-rated item reflects a strong perception that the PUVMP has significantly enhanced commuter safety and reliability across all social classes. Respondents agree that modernization features-such as CCTV cameras, wider doors, assigned seating, and lower steps-improve safety for vulnerable groups including mothers, students, and persons with disabilities. Additionally, operational reforms like route rationalization, cooperative management, and standardized driver training contribute to a safer and more reliable transit environment. These findings support Claudio (2021), who emphasized that a core goal of the PUVMP is to ensure safety and accessibility for all commuters.

Overall, the grand mean of 3.01 ("Agree") suggests that social equity is moderately perceived as a benefit of the modernization program. Respondents particularly recognize improvements in the commuter experience, such as increased accessibility for seniors and persons with disabilities, and safer, more

reliable travel across socioeconomic groups. However, the perceived inequities in operator support highlight ongoing challenges in ensuring that benefits are fairly distributed among all stakeholders. These findings reinforce Zulueta et al.'s (2024) conclusion that while cleaner and safer jeepneys improve mobility for underserved populations, there remains a need to address systemic inequities in support and aid distribution. Despite these challenges, the positive social impacts for commuters demonstrate the potential of the PUVMP to foster a more inclusive and responsive public transportation system.

Table 11: Analysis of Variances (ANOVA) on Challenges of Jeepney Operators - Financial Constraints

Variables	Sum of Squares	Mean Square	P-Value	Decision	Verbal Interpretation
Age	0.353	0.118	0.743	Fail to Reject the Null Hypothesis	Insignificant
Sex	0.404	0.404	0.180	Fail to Reject the Null Hypothesis	Insignificant
Length of Being Jeepney Operators	0.978	0.196	0.631	Fail to Reject the Null Hypothesis	Insignificant
Length of Transition to Modernization	2.095	0.698	0.037	Reject the Null Hypothesis	Significant

Note: If $p < .05$, Reject the Null Hypothesis If $p > .05$, Fail to Reject the Null Hypothesis

Age and financial constraints. The analysis on variances (ANOVA) showed that age is an insignificant predictor of financial constraints among jeepney operators, with a Sum of Squares of 0.353, a Mean Square of 0.118, and a p-value of 0.743, which is well above the 0.05 significance level. This suggests that there is no significant difference in financial challenges across different age groups, hence the failure to reject the null hypothesis. Regardless of whether operators are young or elderly, they appear to face similar financial challenges when it comes to transitioning to modernized vehicles and systems.

This finding aligns with the idea that modernization policies and financial structures, such as the requirement for jeepney operators to purchase new vehicles, apply equally across age groups (Philippine Institute for Development Studies, 2023). Although age differences can influence technological adaptability (as shown in previous studies on digital and technological adoption), they do not appear to have the same impact on financial constraints. Thus, the financial burdens experienced during the transition to modernized jeepneys may be more systemic and policy-driven than age-related.

Sex and financial constraints. Similarly, sex was found to have no significant impact on financial constraints, with a Sum of Squares and Mean Square of 0.404 and a p-value of 0.180. These results indicate that male and female jeepney operators experience virtually identical financial challenges during the modernization process.

This suggests that the costs associated with the PUVMP, including vehicle purchases, compliance costs, and other financial requirements, affect operators equally, regardless of sex. There appears to be no financial advantage or disadvantage based on sex.

This finding supports the study of Gaspay and Salison (2024), who noted that financing schemes, loans, and payment schedules are structured in a way that does not differentiate between male and female operators. Since gender does not play a role in influencing the financial burden, it highlights the

importance of focusing on broader structural factors—such as access to financial resources, availability of government support, and overall program design—when addressing financial disparities within the modernization process.

Length of being a jeepney operator and financial constraints. The results showed that the length of service as a jeepney operator did not significantly affect financial constraints. It resulted in a Sum of Squares of 0.978, a Mean Square of 0.196, and a p-value of 0.631. This suggests that both long-term operators and those newer to the profession experience similar financial burdens in relation to the PUVMP's demands. This suggests that having more years of experience in the industry does not provide any significant advantage in coping with the financial demands of modernization. Although experienced operators may have a better understanding of traditional jeepney operations, this experience does not appear to shield them from the financial costs of modernization, such as purchasing new units or retrofitting older vehicles to meet environmental standards.

This finding is consistent with the study of Gaspay and Salison (2024), who emphasized that financial constraints under the Public Utility Vehicle Modernization Program (PUVMP) are systemic in nature and felt by all operators regardless of their length of tenure. Moreover, Landayan et al. (2024) found that the lack of flexible financing schemes continues to be a major barrier regardless of an operator's tenure, reinforcing the notion that the financial burden is driven more by policy and structural limitations than by individual experience. Financial constraints in this context are more likely driven by systemic factors—such as the high cost of new vehicles and insufficient financial support—rather than the operator's experience in the industry. It also suggests that longer service might not result in better financial preparedness or more favorable financial terms, given that the PUVMP applies similar financial requirements to all operators, regardless of their experience.

Length of transition to modernization and financial constraints. In contrast, the analysis revealed that the length of transition to modernization significantly affects the financial constraints experienced by jeepney operators, with a Sum of Squares of 2.095, a Mean Square of 0.698, and a p-value of 0.037, indicating a statistically significant result at the 0.05 level This suggests that operators who have been involved in the transition process for a longer period may face greater financial strain compared to those who have only recently started the modernization process.

This finding suggests that prolonged periods of transition can lead to a build-up of costs, such as extended debt repayment, operational disruptions, and the need to maintain older vehicles while waiting for financial support or newer models to be available. Longer involvement in the transition to modernization can intensify the financial burden, especially when immediate benefits or returns from modernization efforts are delayed.

Abarca (2024) supports this observation, noting that financial hardship often intensifies over time, especially when operators do not see immediate returns on their investment in new vehicles or technologies. Moreover, Gaspay and Salison (2024) argue that the delayed implementation of financial aid, along with fluctuating income levels due to the disruptions caused by modernization, can compound the financial difficulties for operators who have been transitioning for an extended period. This highlights the importance of timely and consistent financial support mechanisms to reduce the cumulative strain felt by operators, especially those who have been in the process for several years.

Table 12: Analysis of Variances (ANOVA) on Challenges of Jeepney Operators – Technological Adaptations

Variables	Sum of Squares	Mean Square	P-Value	Decision	Verbal Interpretation
Age	7.497	2.499	0.002	Reject the Null Hypothesis	Significant
Sex	0.001	0.001	0.960	Fail to Reject the Null Hypothesis	Insignificant
Length of Being Jeepney Operators	6.205	1.241	0.034	Reject the Null Hypothesis	Significant
Length of Transition to Modernization	2.493	0.831	0.194	Fail to Reject the Null Hypothesis	Insignificant

Note: If $p < .05$, Reject the Null Hypothesis If $p > .05$, Fail to Reject the Null Hypothesis

Age and technological adaptation. The results showed that age is a highly significant factor of technological adaptation among jeepney operators. The analysis yielded a Sum of Squares value of 7.497, a Mean Square value of 2.499, and a p-value of 0.002, which is well below the 0.05 significance level. This indicates that age plays a substantial role in the differences observed in how drivers handle modernization. It also shows that the result is statistically significant.

This suggests that older and younger jeepney operators differ significantly in how they adjust to technological advancements such as GPS tracking, route management, and automated fare collection. Younger operators may adapt more easily, while older operators could face greater challenges, requiring more intensive support and training from the government.

This finding is reinforced by the reviewed literature, highlighting the complexity of technological adaptation among jeepney operators. Dela Cruz (2023) and Atos et al. (2021) emphasized that jeepney operations traditionally depend on manual systems, suggesting that retraining is needed for a successful technological adaptation. This is also further supported by Dickerson (2020), who found that age disparities lead to difficulties in following GPS directions and that younger users found it significantly easier to adapt. Additionally, in-person training with troubleshooting, route changes, and system navigation was found to be the most effective method of instruction. Similarly, Jaiswal et al. (2022) identified younger individuals as early adopters of electric vehicles, forming distinct psychographic groups that reflect a general openness to new transportation technologies.

Sex and technological adaptation. This variable showed no significant influence on technological adaptation. The analysis revealed that its Sum of Squares and Mean Square both resulted to a value of 0.001, and a p-value of 0.960, which is far above the 0.005 significance level. The results show that there is almost no difference between male and female jeepney operators when it comes to adapting to technology. The p value of 0.960 also suggests that male and female operators perform indistinguishably in terms of adapting to technology in PUVMP. Both sexes are equally capable of adjusting to innovations such as GPS navigation, digital fare systems, and other forms of modernized technologies in the new jeepneys as sex does not appear to be a determining factor in technological adaptability within this sector.

These findings align with Greenwood and Baldwin (2022), who found no significant difference in objective knowledge of automated operation between male and female.

Length of being a jeepney operator and technological adaptation. The results showed that the length of being a jeepney operator is a highly significant determinant of technological adaptation. The analysis produced a Sum of Squares of 6.205, a Mean Square of 1.241, and a p-value of 0.034. This suggests that the number of years an operator has been driving explains a noticeable part of the differences in how they adapt to modernization. The mean square also shows the average variation in adaptation levels between groups with different lengths of service. With a p-value of 0.034, which is lower than the standard threshold of 0.05, the findings suggest that the length of experience as a jeepney operator significantly influences how well they adjust to new technologies.

The reviewed studies support these findings, noting that having a large amount of experience can help prepare people for new systems, it might also reinforce their resistance. (LTFRB, 2021; Biona et al., 2023). This result also aligns with Sun et al. (2020), who found that technology readiness and acceptance are influenced by experience. Among jeepney operators, the length of service may shape not only familiarity with traditional systems but also openness—or resistance—to newer technologies introduced by the PUVMP.

Length of transition to modernization and technological adaptation. The length of transition to modernization was not a significant predictor of technological adaptation. The analysis produced a Sum of Squares of 2.493, a Mean Square of 0.831, and a p-value of 0194. The Sum of Squares value indicates that the length of transition to modernization explains only a small part of the differences in how operators adapt to new technology. The Mean Square also shows that the average variation between groups based on transition time is also quite low. In line with this, with a p-value of 0.194, which is higher than the 0.05 threshold, these findings indicate that the duration of the transition to modernization does not significantly affect the challenges operators face in terms of technological adaptation.

This outcome is in line with literature findings indicating that time alone does not equate to successful adaptation. Although the PUVMP was introduced in 2017, challenges related to financial barriers, lack of inclusive training, and structural adjustments persist, preventing a smooth transition despite the passage of time (Gatarin, 2024; Biona et al., 2023). These findings are also consistent with Gaspay et al. (2024), who noted that the length of time since modernization initiatives began has little effect on how operators adapt. This suggests that regardless of how long modernization has been underway, the presence (or absence) of support systems, financial assistance, and retraining opportunities matter more in shaping adaptation outcomes.

Overall, the study revealed that although demographic factors such as age and experience play a significant role in how operators navigate the technological changes brought about by the PUVMP, structural and institutional support is also needed to ensure that they are equipped to adapt successfully. These findings support the notion that the modernization of the PUVMP should be carried out in a holistic manner, with programs that cater to the needs of the operators.

Table 13: Analysis of Variances (ANOVA) on Challenges of Jeepney Operators – Regulatory Compliance

Variables	Sum of Squares	Mean Square	P-Value	Decision	Verbal Interpretation
Age	1.725	0.575	0.388	Accept the Null Hypothesis	Insignificant
Sex	0.423	0.423	0.364	Accept the Null	Insignificant

Variables	Sum of Squares	Mean Square	P-Value	Decision	Verbal Interpretation
Age	1.725	0.575	0.388	Accept the Null Hypothesis	Insignificant
				Hypothesis	
Length of Being Jeepney Operators	5.469	1.094	0.081	Accept the Null Hypothesis	Insignificant
Length of Transition to Modernization	2.961	0.987	0.155	Accept the Null Hypothesis	Insignificant

Note: If $p < .05$, Reject the Null Hypothesis If $p > .05$, Fail to Reject the Null Hypothesis

Age and regulatory compliance. The ANOVA results revealed that age has no significant effect on the challenges faced by jeepney operators in terms of regulatory compliance, the variable age had a sum of squares of 1.725, a mean square of 0.575, and as indicated by p-value of 0.388. This means that regardless of whether operators are younger or older, they experience similar difficulties in complying with regulatory requirements. The uniformity of responses across age groups suggests that the challenges are not influenced by age but are instead systemic in nature, affecting all operators equally. This finding is supported by the statistical data presented in Table 13.

This result is in line with findings by Gatarin (2024), who observed that jeepney operators of various ages face common regulatory hurdles, regardless of their experience or generational differences. Moreover, Dimalanta, Atienza, and Samonte (2024) suggest that the challenges operators face in complying with PUVMP regulations are more closely related to the general complexity of the regulatory system and insufficient support mechanisms, rather than differences in age. These insights emphasize that improving clarity and accessibility in regulatory processes could benefit operators of all age groups, ensuring that no group is disproportionately affected by the rules.

Sex and regulatory compliance. The ANOVA results indicated no significant difference between sex and the challenges faced by jeepney operators in terms of regulatory compliance, with a sum of squares of 0.423, a mean square of 0.423, and a p-value of 0.364. This suggests that both male and female operators perceive regulatory issues similarly. The data implies that gender does not influence how operators experience or respond to compliance requirements, such as registration, licensing, or policy adherence. Therefore, regulatory challenges appear to be uniformly experienced regardless of the operator's sex, as reflected in the findings of Table 13.

This aligns with findings from the Department of Transportation (2023), which states that the PUVMP's regulations are designed to be neutral and apply equally to all jeepney operators, irrespective of gender. Gatarin (2024) similarly noted that the regulatory challenges are uniform for both male and female operators, largely due to the technical and financial barriers imposed by the PUVMP's transition. This suggests that policies aimed at improving regulatory compliance should focus on systemic changes, such as clearer communication, accessible training, and stronger financial support, rather than targeting gender-specific interventions.

Length of being a jeepney operator and regulatory compliance. The ANOVA results showed that the length of being a jeepney operator does not significantly influence the challenges faced in terms of regulatory compliance, with the sum of squares 5.469, the mean square of 1.094, and a p-value of 0.081. Although this value is relatively close to the 0.05 threshold, it still falls above the significance level, leading to the acceptance of the null hypothesis. This suggests that both newly established and long-time operators perceive regulatory issues similarly. The challenges they face—such as permits, modernization requirements, and policy enforcement—are consistent regardless of how long they have been in the profession, indicating that experience does not necessarily ease compliance burdens (Table 13).

This finding reflects the broader literature on regulatory compliance in the transport sector, where experience does not necessarily equate to an easier transition to modernization. As noted by the Philippine Institute for Development Studies (2023), the complexity of regulatory policies and the lack of clear guidance or accessible resources have made compliance difficult for operators of all experience levels. Dimalanta et al. (2024) further argue that veteran jeepney operators, while familiar with traditional systems, may face resistance to change, making them just as likely to struggle with new regulations as their newer counterparts. This suggests that regulatory compliance in the PUVMP is influenced more by the clarity of the regulations and the availability of support, rather than the length of time an operator has been in the business.

Length of transition to modernization and regulatory compliance. The ANOVA results showed that the length of transition to modernization does not significantly influence the challenges faced by jeepney operators in terms of regulatory compliance, with a sum of squares 2.961, a mean square of 0.987, and a p-value of 0.155. This suggests that whether an operator is early or late in the modernization process, they still encounter similar regulatory burdens. The lack of significant difference implies that compliance challenges are consistently experienced across all stages of modernization, highlighting the broader, systemic nature of these issues.

These findings are consistent with prior studies emphasizing that regulatory compliance challenges under the PUVMP are structural rather than demographic. Guno et al. (2021) explained that operators of varying backgrounds face similar regulatory burdens due to a lack of clear policy guidelines and fragmented support systems. Likewise, Grecia (2023) reported that even experienced operators struggle with permit acquisition, technological mandates, and cooperative requirements, regardless of their age, sex, or time in the industry. These challenges, therefore, reflect the broader institutional gaps within the modernization framework rather than limitations specific to individual operators.

The ANOVA findings confirmed that jeepney operators face similar challenges in regulatory compliance regardless of their age, sex, years of experience, or length of transition to modernization, as all demographic variables produced p-values above the 0.05 significance level. This indicates that personal background does not significantly influence how operators experience the demands of the PUVMP. Instead, the results point to possible systemic issues—such as complex procedures, unclear guidelines, and limited access to assistance—that affect all operators uniformly. Thus, these findings underscore the need to improve regulatory processes and provide broader, more accessible support rather than relying on targeted interventions based on operator profiles.

Table 14: Analysis of Variances (ANOVA) on Benefits of Jeepney Operators – Economic Opportunities

Variables	Sum of Squares	Mean Square	P-Value	Decision	Verbal Interpretation
Age	1.550	0.517	0.164	Accept the Null Hypothesis	Insignificant
Sex	0.103	0.103	0.562	Accept the Null Hypothesis	Insignificant
Length of Being Jeepney Operators	1.149	0.230	0.590	Accept the Null Hypothesis	Insignificant
Length of Transition to Modernization	1.187	0.396	0.274	Accept the Null Hypothesis	Insignificant

Note: If $p < .05$, Reject the Null Hypothesis If $p > .05$, Fail to Reject the Null Hypothesis

Age and economic opportunities. The results from Table 14 indicate that the sum of squares was 1.550, with a mean square of 0.517 and a p-value for the variable "Age" in relation to economic opportunities among jeepney operators is 0.164, which is greater than the significance threshold of 0.05. This means that there is no statistically significant difference between age and the perceived economic opportunities for jeepney operators, leading to the acceptance of the null hypothesis. In the discussion, this suggests that age does not play a significant role in influencing the economic benefits that jeepney operators experience, implying that opportunities are distributed similarly regardless of the operator's age. The interpretation of these findings is that interventions or policies aimed at improving economic opportunities for jeepney operators should not be age-specific, as age does not significantly impact these benefits in relevance of the results shown on Table 14.

This finding is consistent with the study by Gaspay and Salison (2024), which noted that financial and economic impacts under the Public Utility Vehicle Modernization Program affect operators regardless of age, emphasizing that structural factors, such as program design and cooperative requirements, outweigh demographic distinctions. In addition, Agaton, Collera, and Guno (2020) indicated that economic returns from e-jeepneys (e-PUVs) are substantial due to fuel savings and energy efficiency—opportunities accessible regardless of age, suggesting that economic benefit is not significantly age-dependent.

Sex and Economic Opportunities. The statistical analysis showed that the sum of squares of 0.103, a mean square of 0.103 and the p-value was found to be 0.562, which is also greater than 0.05, indicating no significant difference. This means that there is no statistically significant difference between male and female jeepney operators regarding the economic benefits they receive. This result suggests that sex does not play a crucial role in determining the economic opportunities available to jeepney operators, indicating that both male and female operators experience similar economic outcomes within this sector. The interpretation of this finding is that policies or interventions aimed at improving economic opportunities for jeepney operators do not need to be gender-specific, as the benefits are distributed equally regardless of sex. This aligns with the decision to accept the null hypothesis and the verbal interpretation of the result as "insignificant" (Table 14).

Consequently, the null hypothesis—which states that there is no difference in economic opportunity perceptions between sexes—is accepted. The ANOVA test showed no significant difference in perceived economic opportunities when grouped by sex. This aligns with findings by Greenwood & Baldwin (2022),

who reported no gender-based variance in readiness for technological and operational changes in public transport, suggesting that both male and female operators equally recognize the income potential of modern jeepneys. Gaspay and Salison (2024) also emphasized that financing structures under the Public Utility Vehicle Modernization Program do not discriminate based on gender, ensuring equal opportunity to benefit from modernization.

Length of being a jeepney operator and economic opportunities. The results from Table 14 indicate that there is no significant difference between the length of being a jeepney operator and the perceived economic opportunities, as indicated by the sum of squares was 1.149, with a mean square of 0.230 and a p-value of 0.590, which is greater than the 0.05 significance level. This result suggests that the duration of experience as a jeepney operator does not significantly influence the economic benefits they receive from their occupation. The decision to accept the null hypothesis and the verbal interpretation of "insignificant" further reinforce that length of service does not play a crucial role in shaping economic opportunities for jeepney operators. This means that regardless of how long an individual has been operating a jeepney, there is no notable difference in the economic benefits they perceive or receive. This finding suggests that factors other than experience or tenure as a jeepney operator may play a more critical role in shaping economic opportunities in this sector.

These results align with existing literature sources as Gaspay and Salison (2024) Indicated that financial and economic burdens of modernization cut across experience levels. Veteran operators were just as vulnerable to financial instability as newcomers. In addition, Velasco (2023) concluded that economic opportunities under the PUVMP are influenced more by policy structure and vehicle efficiency than by individual characteristics, indicating a system-wide impact rather than a profile-specific benefit.

Length of transition to modernization and economic opportunities. The results from Table 14 indicate that the variable "Length of Transition to Modernization" has a sum of squares of 1.187, a mean square of 0.396, and a p-value of 0.274, which is greater than the significance threshold of 0.05. This suggests that regardless of how long operators have been transitioning to modernization, their perceptions of economic opportunities remain similar. Whether they had recently transitioned or had been operating modern jeepneys for some time, their views on economic opportunities remained consistent as the results have shown that the length of transition to modernization among jeepney drivers does not significantly impact jeepney operators' views on economic benefits.

This result aligns with the findings by Velasco (2023), in which he argues that economic opportunities under the PUVMP are determined more by the structure of government policy and vehicle efficiency than by personal characteristics like transition length. This supports the idea that the modernization transition timeline does not create unequal economic outcomes among operators. Mendoza (2021), also noted that while the Public Utility Vehicle Modernization Program (PUVMP) can increase operational efficiency and profitability, these benefits tend to be uniformly experienced across jeepney operators, regardless of how long they have been engaged in the modernization transition.

The ANOVA results indicated that perceived economic opportunities among jeepney operators did not significantly differ based on profile variables such as age, sex, years of experience, or length of transition, with all p-values exceeding the 0.05 significance level. This suggests that regardless of demographic differences or the duration of participation in the modernization program, operators shared similar views reflecting a consistent perception of economic benefits across the group.

Table 15: Analysis of Variances (ANOVA) on Benefits of Jeepney Operators – Environmental Improvements

Variables	Sum of Squares	Mean Square	P-Value	Decision	Verbal Interpretation
Age	0.835	0.278	0.789	Fail to Reject the Null Hypothesis	Insignificant
Sex	0.051	0.051	0.697	Fail to Reject the Null Hypothesis	Insignificant
Length of Being Jeepney Operators	4.583	0.917	0.014	Reject the Null Hypothesis	Significant
Length of Transition to Modernization	2.216	0.739	<0.01	Reject the Null Hypothesis	Significant

Note: If $p < .05$, Reject the Null Hypothesis If $p > .05$, Fail to Reject the Null Hypothesis

Age and environmental improvements. The analysis of variance (ANOVA) showed that age is not a significant predictor of perceived environmental improvements among jeepney operators. With a Sum of Squares of 0.835, a Mean Square of 0.278, and a p-value of 0.789, the results clearly fall above the 0.05 significance threshold. This suggests that jeepney operators across different age groups perceive the environmental benefits of modernization, similarly, leading to the failure to reject the null hypothesis.

This finding is consistent with the study of Viray (2022), which stated that age has no strong significant effect on environmental concern. Regardless of whether operators are young or elderly, their perceptions of improvements such as reduced emissions or cleaner air quality remain comparable. Similarly, the Philippine Institute for Development Studies (2023) also emphasized that modernization policies and their environmental goals are universally applied, regardless of the operator's age.

Sex and environmental improvements. Similarly, the sex of the jeepney operators was found to have no significant impact on their perception of environmental improvements. The Sum of Squares and Mean Square values were both 0.051, with a corresponding p-value of 0.697. These results indicate that male and female jeepney operators perceive environmental benefits equally during the modernization process.

This aligns with the findings of Greenwood and Baldwin (2022), who emphasized that sex differences do not significantly influence perceptions of environmental issues. The neutrality in perception suggests that environmental improvements brought by the modernization efforts are recognized across sex lines without noticeable bias or disparity. Furthermore, Gaspay and Salison (2024) highlighted that modernization strategies, particularly in terms of emission reductions, are presented equally to both male and female operators, regardless of sex.

Length of being a jeepney operator and environmental improvements. In contrast, the analysis revealed that the length of time operators have been in service significantly affects their perception of environmental improvements. The Sum of Squares was 4.583, the Mean Square was 0.917, and the p-value was 0.014, indicating a statistically significant difference at the 0.05 level.

Operators with less than a year of experience exhibited stronger appreciation for the environmental benefits associated with modernized jeepneys. These newer operators, having minimal exposure to traditional jeepney operations, tend to embrace the changes more readily and recognize the advantages such as reduced emissions and better air quality. This finding is supported by the Philippine Public Utility Vehicle Modernization Program (PUVMP), which recorded a 40% to 60% emission reduction during trial phases in

Manila. Similarly, Zhang et al. (2020) observed that newer consumers are more inclined to adopt energy-efficient technologies.

Meanwhile, operators with 16 to 20 years of experience also showed a marginally significant difference. Long-term operators, though initially resistant—often due to financial burdens as emphasized in the study of Landayan et al. (2024)—may gradually acknowledge the environmental benefits after witnessing long-term pollution effects caused by traditional diesel-powered jeepneys, as reported by the Blacksmith Institute (Rivas, 2023).

Length of transition to modernization and environmental improvements. The analysis also indicated a statistically significant difference between the length of transition to modernization and the perceived environmental benefits. The Sum of Squares was 2.216, the Mean Square was 0.739, and the p-value was less than 0.01, demonstrating a high level of statistical significance.

Jeepney operators who have undergone the modernization process for more than five years reported greater recognition of environmental benefits, such as improved operational efficiency and emission reductions, consistent with the objectives of the PUVMP. This suggests that extended exposure to modernized practices leads to greater appreciation and understanding of the environmental improvements.

Mendoza (2021) highlights that although modernization initiatives result in real environmental improvements, jeepney operators need longer exposure to fully realize and appreciate these benefits. Likewise, Mateo-Babiano et al. (2020) emphasized that the transition from operating traditional jeepneys to modernized units can be challenging, especially for those deeply familiar with the old system, thus affecting the immediate acceptance of the program's environmental objectives.

Table 16: Analysis of Variances (ANOVA) on Benefits of Jeepney Operators – Social Equity

Variables	Sum of Squares	Mean Square	P-Value	Decision	Verbal Interpretation
Age	1.202	0.401	0.491	Fail to Reject the Null Hypothesis	Insignificant
Sex	0.205	0.205	0.521	Fail to Reject the Null Hypothesis	Insignificant
Length of Being Jeepney Operators	1.975	0.395	0.555	Fail Reject the Null Hypothesis	Insignificant
Length of Transition to Modernization	1.239	0.413	0.477	Fail Reject the Null Hypothesis	Insignificant

Note: If $p < .05$, Reject the Null Hypothesis If $p > .05$, Fail to Reject the Null Hypothesis

Age and social equity. The analysis of variance (ANOVA) revealed that age is not a significant predictor of social equity benefits among jeepney operators, with a Sum of Squares of 1.202, a Mean Square of 0.401, and a p-value of 0.491, which is above the 0.05 significance level. This suggests that there is no significant difference in the benefits of social equity across different age groups. Regardless of whether operators are young or elderly, they seem to experience similar benefits related to social equity in the modernization process.

This finding aligns with the work of Gaspay and Salison (2024), who noted that age does not appear to influence the outcomes of the Public Utility Vehicle Modernization Program (PUVMP) in terms of

perceived social benefits. Whether younger or older, operators face similar challenges and rewards, largely driven by the systemic nature of the program rather than individual demographic factors.

Sex and social equity. Similarly, the analysis of variance (ANOVA) showed no significant difference in social equity benefits based on sex. The Sum of Squares for sex was 0.205, a Mean Square of 0.205, and a p-value of 0.521, suggesting that male and female jeepney operators perceive social equity similarly. There is no significant advantage or disadvantage in terms of social benefits from the modernization process based on gender.

This supports the findings of Gaspay and Salison (2024), who observed that the financial and operational aspects of the PUVMP are structured to apply equally to male and female operators. The study also highlights that social equity, as a component of the modernization process, does not show gender-based disparities. Operators of different sexes encounter similar challenges related to social inclusion, regardless of their sex.

Length of being a jeepney operator and social equity. The results indicated that the length of time as a jeepney operator does not significantly affect social equity benefits. The Sum of Squares for length of service was 1.975, with a Mean Square of 0.395, and a p-value of 0.555, suggesting that both long-term operators and those newer to the profession experience similar benefits regarding social equity during the transition to modernization.

This finding mirrors Gaspay and Salison (2024), who stated that the benefits of the PUVMP, including social equity, are equally experienced by both long-standing and newer operators. Landayan et al. (2024) emphasized that the perceived benefits related to inclusivity, such as improved access for marginalized groups, do not differ significantly based on the length of service in the industry. It indicates that social equity is not contingent on experience but rather on the broader structural factors set forth by the modernization policy.

Length of transition to modernization and social equity. The analysis also revealed no significant differences in the social equity benefits based on the length of time spent in the transition to modernization. The Sum of Squares for length of transition was 1.239, with a Mean Square of 0.413, and a p-value of 0.477, indicating no significant effect of the length of transition on the perceived benefits of social equity.

This result is consistent with the work of Zulueta et al. (2024) and Gaspay and Salison (2024), who found that while prolonged periods of transition may cause operational disruptions and financial strain, these factors do not appear to influence the perceived social equity outcomes. Operators, regardless of how long they have been involved in the transition process, report similar benefits regarding social inclusion and accessibility, underscoring the inclusive nature of the PUVMP.

Table 17: Proposed Action Plan Based on the Study's Findings

Key Results Area	Objectives	Strategies /Activities	Time Frame	Persons Involved	Financial Requirements & Sources of Funds	Success Indicators
1. Financial constraints emerged as the top challenge, especially the high cost of modern jeepneys and limited access to financial support. While most profiles showed no significant difference, operators modernized for over 5 years reported greater financial strain.						

Localized Financial Assistance Program	Develop a special loan assistance and subsidy program for small-scale operators.	- Draft an ordinance for a financial assistance program. - Conduct a needs assessment survey among jeepney operators. - Partner with Landbank/local banks for microfinancing schemes. - Launch the financial assistance application portal or helpdesk.	6 months	-Dasmariñas LGU (Mayor's Office, Transport Office) - City Council	- ₱10 million initial revolving fund - LGU Budget, National Transport Grants, Private Bank CSR Partnerships	Number of operators who received assistance; increased modernization compliance rate.
2. Technological adaptation was not widely seen as a major challenge, but older and more experienced operators reported greater difficulty adapting to modern jeepney technology. Significant differences were found based on age and years of experience, while sex and length of modernization showed no meaningful influence.						
Simulated Jeepney Tech Training Centers	Build confidence through practice-based learning using real equipment of modern jeepneys to help older and long-serving	- Set up mini training centers in two strategic locations (e.g., City Transport Terminal and Barangay Hall with high	Launch in 4 months, operate for 1 year (pilot)	- LGU Dasmariñas (City Engineering for setup) - Transport Cooperatives - Volunteer Tech Instructors	₱700,000 (Simulation equipment, construction materials, trainers' honoraria; sourced from LGU infra fund + transport	200 operators trained in 12 months; 85% confidence increase reported after simulations.

	operators adapt effectively to new technologies	jeepney density). -Install simulated dashboards (GPS, e-payment reader, eco-drive monitor) on stationary frames. - offer daily short training slots for operators to "practice" using the equipment without stress. - Schedule intensive tech coaching sessions every Saturday.			modernization grants)	
3. Regulatory compliance ranked as the second most significant challenge, particularly due to difficulty navigating government websites. These challenges were perceived similarly across all demographic groups, with no significant differences found based on age, sex, experience, or transition duration.						
Simplified Access to Information	Make regulatory information more accessible by streamlining government platforms and communication channels for easier	- Create a Simplified Jeepney Operators' Compliance Handbook in Tagalog (printed and digital). - Develop visual step-by-step	3 months (production and distribution)	- LGU Transport Office - City Communications Office - Transport Cooperatives	₱250,000 (printing, design; sourced from LGU funds or small grants from DOTr or DILG)	Increased percentage of jeepney operators who report ease of accessing and understanding regulatory requirements through

	navigation and understanding.	posters for franchise renewal, registration, and cooperative membership processes. - Distribute materials through terminals, cooperatives, and barangays.				government platforms, as measured by post-implementation surveys or feedback forms.
4. Economic opportunities emerged as the most recognized benefit, especially in gaining a competitive edge in the transport sector. Perceptions of economic benefits were consistent across all profile groups, indicating a shared experience of opportunity regardless of age, sex, or experience.						
Business Development & Inclusivity	Strengthen economic benefits by fostering inclusive business growth and linking operators to complementary industries.	- Organize a "Modern Jeepney Business Fair" at the city plaza to connect operators with suppliers and service providers. - Hold short networking sessions for operators and local businesses to explore partnerships and supply deals.	Short to Medium Term (6–12 months)	- LGU Business Office - Event Organizers - Local Shops	₱350,000 (LGU + DTI event fund)	Increased participation of operators in business development initiatives and partnerships with related industries (e.g., vulcanizing shops, hardware suppliers), measured by enrollment records and income reports post-program.
5. Environmental improvements ranked as the second most valued benefit, particularly in reducing emissions and fuel consumption. While age and sex showed no significant difference, newer operators and those transitioned for over 5 years reported greater appreciation of environmental gains.						

Preventive Maintenance Culture	To institutionalize routine checkups and preventive maintenance among jeepney operators, ensuring consistently low emissions and optimal fuel efficiency for a cleaner urban environment.	- Partner with local auto-repair shops for discounted preventive maintenance check-ups focusing on emissions testing, engine tuning, and preventive maintenance. - Conduct hands-on workshops for drivers and operators on basic engine care, emission control, and fuel-saving practices.	Medium Term (6–12 months)	- LGU Transportation Office - Auto Repair Associations	- Maintenance clinics (venue, tools, subsidies) (₱600,000) - Training workshops (materials, trainers) (₱400,000)	Increased compliance with regular maintenance schedules and a decline in reported emissions or fuel inefficiency, tracked through inspection reports and operator self-assessments.
6. Social equity was the least recognized benefit, with moderate agreement on improved safety for vulnerable passengers. No significant differences were observed across profiles, suggesting shared perceptions regardless of background.						
Support for Disadvantaged Operators	To identify vulnerable jeepney operators and provide them with priority access to government services and simplified financial education,	- Identify at-risk groups (elderly, low-income, small operators) - Launch "PUVMP Equity Card" for priority in government transactions	Medium Term (6–12 months)	- LGU Social Services -LTFRB and DOTr officials - Microfinance Partners	- Program planning and coordination (₱200,000) - Equity Card design, production, and distribution	100 "Equity Cards" issued 70% of cardholders access training/loans successfully

	enabling smoother transition under the PUVMP.	and training slots. - Partner with micro-finance in-stitutions to offer simpli-fied loan briefing ses-sions.			(₱800,000) - Loan briefing sessions (materials, venues, trainers) (₱300,000)	

This section outlines policy recommendations grounded in the most significant challenges and least-perceived benefits identified under each key variable of the study: Financial Constraints, Technological Adaptation, Regulatory Compliance, Economic Opportunities, Environmental Benefits, and Social Equity. Through the analysis of survey results and statistical treatment, specific issues faced by jeepney operators in Dasmariñas under the Public Utility Vehicle Modernization Program (PUVMP) were highlighted, ranging from difficulty in accessing financial aid and adapting to modern technology, to low awareness of business opportunities and limited access to equitable government support.

These policy recommendations are crafted to address those critical concerns and gaps, providing actionable, locally appropriate, and sustainable solutions. They aim to guide the Dasmariñas LGU and relevant national agencies in improving program delivery, promoting inclusive development, and maximizing the intended benefits of PUVMP implementation in the city.

5. Conclusions and Recommendations

5.1. Conclusions. The following statements were concluded based on the findings of the study:

5.1.1. It was concluded that most of the respondents were aged 45–54 years (41%), male (61%), and had 11–15 years of experience as jeepney operators (25%). Furthermore, the majority had only recently transitioned to the PUVMP, with 43% having joined within the past year. This demographic profile suggests that the industry is primarily composed of middle-aged, experienced operators who are still in the early stages of adapting to the modernization program.

5.1.2 The results revealed that the perception of the jeepney operators on the challenges they faced during the modernization transition received an overall interpretation of significantly challenging from the participants, in terms of:

5.1.2.1 Financial Constraints. The researchers conclude that most participants strongly agree that financial constraint is the most significant challenge in the modernization process due to the high costs of vehicle acquisition, limited subsidies, and maintenance.

5.1.2.2 Technological Adaptation. The researchers conclude that technological adaptation is not a major challenge for most jeepney operators. The majority of participants disagreed with statements about difficulties in learning and implementing modern technologies, indicating that they are generally comfortable with adapting to new systems.

5.1.2.3 Regulatory Compliance. The researchers conclude that regulatory compliance is a moderate challenge for jeepney operators. Participants expressed difficulty in navigating government websites,

keeping up with frequent regulatory changes, adhering to strict environmental standards, and understanding complex policies, which collectively make compliance challenging for many operators.

5.1.3. The results revealed that the perception of the jeepney operators on the benefits they experienced from the modernization program received an overall interpretation of significantly beneficial from the participants, in terms of:

5.1.3.1. Economic Opportunities. The researchers conclude that jeepney operators strongly perceive economic opportunities as the most significant benefit of modernization. They believe that modernization gives a competitive edge in the public transportation industry while also creating business opportunities in associated businesses like vulcanizing shops and hardware stores, although to some extent.

5.1.3.2. Environmental Improvements. The researchers conclude that environmental improvements are also viewed as a significant benefit. Many participants strongly agreed that their modernized jeepneys emit less black smoke and that they consume less fuel compared to their older vehicles. These findings support that modernization has contributed positively to environmental quality.

5.1.3.3. Social Equity. The researchers conclude that social equity was perceived as the least significant benefit. While most participants agreed that modernization enhances passenger comfort and reliability, there was less agreement on whether the program ensures equitable access to government support and incentives for all operators, particularly those from marginalized backgrounds.

5.1.4. It was concluded that there was no significant difference between the demographic profile of jeepney operators and the financial constraints they faced in terms of age, sex, or years of experience. However, operators who had been transitioning for more than five years perceived financial challenges differently.

5.1.5 It was concluded that there was a significant difference between the age of jeepney operators and their perceptions of technological adaptation. However, no significant differences were found based on sex or the length of time since transitioning. Operators with more years of experience showed differing perceptions, indicating that experience also influenced how they viewed technological challenges.

5.1.6 It was concluded that there was no significant difference between the demographic profile of jeepney operators and the regulatory compliance challenges they faced in terms of age, sex, years of experience, or length of transition to modernization. This indicates that regulatory compliance was experienced similarly across all demographic groups.

5.1.7 It was concluded that there was no significant difference between the demographic profile of jeepney operators and the benefits they experienced in terms of economic opportunities. Age, sex, years of experience, and length of transition to modernization had no significant impact on their perceptions, implying that economic advantages were viewed equally across different groups.

5.1.8 It was concluded that there was no significant difference between the age or sex of jeepney operators and the benefits they experienced in terms of environmental improvements. However, the length of time being a jeepney operator was found to be significant, with new operators being more appreciative of the environmental benefits. Operators with 16 to 20 years of experience showed a marginally significant differe with these benefits. Furthermore, the length of transition to modernization was a significant factor, with those who transitioned for more than five years experiencing greater environmental improvements.

5.1.9 It was concluded that there was no significant difference between the demographic profile of jeepney operators and the benefits they experienced in terms of social equity. Age, sex, years of experience, and length of transition had no impact, indicating that views on social equity were consistent across all groups.

5.2. Recommendations. Based on the findings, the researchers thereby arrived with the following recommendations:

5.2.1. The researchers recommend developing targeted support programs that address the specific needs of middle-aged, experienced jeepney operators who are newly transitioning to the PUVMP, to facilitate smoother adaptation and sustained engagement in the modernization process.

5.2.2. The researchers recommend prioritizing financial support mechanisms to alleviate the high costs of vehicle acquisition and maintenance, while also simplifying regulatory processes and providing clear guidance to help jeepney operators navigate compliance requirements more effectively, given that technological adaptation is generally manageable for most operators.

5.2.3. The researchers recommend enhancing efforts to promote and expand economic and environmental benefits of modernization while addressing gaps in social equity by ensuring more inclusive access to government support and incentives, especially for marginalized jeepney operators.

5.2.4 The researchers suggest implementing a tailored financial support system that specifically addresses the evolving needs of long-term transitioning jeepney operators, while maintaining broad-based assistance for all. This approach recognizes that financial challenges change over time and ensures more effective, stage-sensitive support throughout the modernization journey.

5.2.5 The researchers suggest designing age- and experience-sensitive training programs that tailor technological adaptation support to the unique needs of different operator groups. By customizing learning approaches, the program can better engage both younger and more experienced drivers, enhancing overall adoption and confidence in new technologies.

5.2.6 The researchers suggest implementing a unified, user-friendly regulatory support system that simplifies compliance processes for all jeepney operators, regardless of demographic differences. This inclusive approach ensures equal access to clear guidance and assistance, reducing barriers and fostering smoother adherence to modernization regulations.

5.2.7 The researchers suggest developing inclusive economic empowerment programs that equally support all jeepney operators, recognizing that economic benefits of modernization are perceived uniformly. By providing universal access to financial literacy, business development, and partnership opportunities, the program can maximize economic gains across the entire operator community.

5.2.8 The researchers suggest creating targeted awareness and engagement initiatives that connect experienced operators with newer and long-transitioned peers to share insights on environmental benefits. This peer-driven approach can deepen appreciation among veteran operators and reinforce the positive impact of modernization across all experience levels.

5.2.9 The researchers suggest implementing community-based forums and inclusive decision-making platforms that engage all jeepney operators equally, fostering a shared understanding and collective action to enhance social equity throughout the modernization process.

5.2.10 Lastly, the researchers recommend that future studies adopt a “transition journey mapping” approach to track jeepney operators’ experiences, challenges, and benefits over multiple years. This longitudinal research should focus on the sustainability of the modernization transition-specifically, the long-term economic viability, environmental impact, and social resilience of operators as they adapt to new technologies and regulations. Such insights will enable policymakers to develop adaptive, stage-specific interventions that support operators’ enduring success and inclusivity throughout the modernization process.

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