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Economic Suitability of Electronic Fare Meters for Tricycle Drivers in Cabanatuan City

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Abstract *— This descriptive study investigated the economic suitability of electronic fare meters for tricycle drivers in Cabanatuan City, Philippines, using a stratified random sampling technique and a self-made survey questionnaire. The research found that tricycle drivers in Cabanatuan City generally operate under a distance-based fare structure with varying passenger ridership and daily income levels. While most drivers were aware of electronic fare meters, their perceptions regarding potential benefits and concerns were mixed. Some expressed concerns about upfront costs and fare reductions, while others acknowledged the potential for fairer fares, improved passenger trust, and easier fare collection. Overall, the findings suggest that electronic fare meters could offer economic benefits for tricycle drivers in Cabanatuan City, particularly through increased efficiency and potentially higher income. However, successful implementation requires careful consideration of driver concerns and the development of strategies to address issues like affordability and potential income fluctuations.*

Keywords *— **Economic suitability; Electronic fare meters; Sustainable transportation; Technology adoption; Tricycle transportation***

I. INTRODUCTION

The tricycle is a form of public transportation in the Philippines, particularly significant for short-distance travel and last-mile connections within cities. In Cabanatuan City, Nueva Ecija, tricycles play a vital role in daily commutes, providing an affordable and accessible transportation option for many residents. Cabanatuan City has earned the moniker "Tricycle Capital of the Philippines" due to the sheer number of tricycles operating within its borders. Studies estimate that there are over 30,000 registered tricycles in the city (Balaria, 2016), highlighting their crucial role in the city's transportation network.

In Cabanatuan City, a fare matrix was established in 2019 and displayed on stickers for tricycles with franchises. Table 1 outlined fares for the first three kilometers.

For distances exceeding three kilometers, an additional five pesos was charged per passenger per kilometer.

However, this fare matrix is currently outdated and not strictly enforced. The lack of a new fare matrix from the local government unit (LGU) has resulted in a system based on negotiation or a fixed rate, leading to inconsistencies and potential disputes between drivers and passengers. This lack of a standardized fare system can create uncertainty for both parties.

Passengers may be unsure of the appropriate fare, and drivers may struggle to ensure they receive fair compensation for their journeys. Furthermore, the absence of a clear and reliable fare structure may limit transparency and accountability within the tricycle transport sector (Philippine Daily Inquirer, 2019).

Table 1 Current Tricycle Fare Matrix in Cabanatuan City

	Regular Passenger	Student / Senior Citizen / Person with Disability
Single passenger	Php 20.00	Php 15.00
Two or more passenger	Php 15.00	Php 10.00

Electronic fare meters have emerged as a potential solution to address inefficiencies and inconsistencies within the Philippine transportation system. While traditionally used in buses and taxis, the technology holds promise for the tricycle sector, a dominant mode of public transport, particularly in cities. Electronic fare meters can be programmed with a predetermined fare structure based on distance travelled or other factors (Sacromento, 2019). This eliminates the need for negotiation, ensuring passengers are charged a consistent and fair fare regardless of their bargaining skills or the driver they encounter (Philippine Daily Inquirer, 2019). The lack of standardization on the current fare collection, as highlighted in a report by the Philippine Department of Transportation (DOTr) (2023), can lead to confusion and disagreements between passengers and drivers. Another study emphasizes the need for a more sustainable tricycle transport system, including a fare system that ensures both economic viability and environmental responsibility (Balaria, et al., 2017) Electronic fare meters offer a compelling solution to these challenges.

By implementing a standardized fare structure based on distance travelled or other factors, meters can ensure fairness and transparency; passengers are charged a consistent and predetermined fare, eliminating negotiation and potential disputes (Sacromento, 2019). Moreover, a clear fare structure can guarantee drivers receive fair compensation for their services, potentially leading to increased and stable income. Research by Ong et al. (2021) highlights the importance of understanding passenger satisfaction with tricycle service quality, which can inform efforts to improve the industry. Electronic meters can also streamline the fare collection process, reducing waiting times and friction between passengers and drivers.

Limited implementations of electronic fare meters in tricycles exist within the Philippines. A pilot program in Davao City in 2019 implemented meters in 1,000 tricycles (Philippine Daily Inquirer, 2019). The program yielded positive results in terms of passenger satisfaction and streamlined fare collection. However, challenges remain, including upfront costs. The cost of acquiring and installing electronic meters can be a barrier for some tricycle drivers. Some drivers also fear lower fares due to government regulation of meter rates (Philippine Daily Inquirer, 2019). Ensuring proper maintenance and technical support for the meters is also crucial for long-term success (Sacromento, 2019).

Further research is crucial to assess the economic viability of electronic fare meters for tricycles across the Philippines. Studies like this one, focusing on Cabanatuan City, can be replicated in other tricycle-dominant areas to understand the broader economic impact. Public perception is another critical factor. Understanding driver concerns and passenger preferences through surveys can help tailor meter implementation strategies to address potential anxieties and ensure a smooth transition.

II. METHODOLOGY

This study employed a descriptive research method using a self-made survey questionnaire to gather data from tricycle drivers in Cabanatuan City. A survey approach is well-suited for this study as it allows for efficient data collection from a large and geographically dispersed population of tricycle drivers (Creswell & Creswell, 2018). A stratified random sampling technique was used to ensure a representative sample of tricycle drivers across different areas of the city. This involved dividing the

city into distinct areas based on its location, calculating the appropriate sample size within each stratum and randomly selecting participants within each stratum to ensure unbiased representation. As a result, 327 tricycle drivers were chosen as respondents to this study.

The self-made survey questionnaire was distributed among the tricycle drivers and covered the current economic landscape such as socio-demographic profile, current fare structure and operational costs, as well as the drivers' awareness of electronic fare meter technology and their perception of the potential benefits and concerns regarding implementation and willingness to adapt electronic fare meter systems.

Descriptive statistics was used to analyze the collected data. This involved frequency distributions for categorical variables to understand the prevalence of different characteristics within the sample and measures of central tendency to provide an overview of typical values.

III. RESULTS AND DISCUSSIONS

Current Economic Landscape of Tricycle Drivers in Cabanatuan City

Understanding the current economic landscape of tricycle drivers in Cabanatuan City is crucial for assessing the potential impact of electronic fare meters on their livelihoods. This section includes the demographics, experience, and ownership patterns of tricycle drivers in the city, providing a snapshot of their economic situation.

Socio-Demographic Profile of Tricycle Drivers

The average age of the drivers was 42 years old, with a range of 21 to 65 years. The most common age group was 31-40 years old, with 193 respondents, accounting for nearly 60% of respondents.

The majority of respondents (94.80%) were male, with only 17 females out of the 327 respondents. This confirms the male-dominated nature of the tricycle driver profession (World Bank, 2023) and aligns with the broader social context in the Philippines, where physically demanding occupations like driving are often seen as more suitable for men. The study also showed that the average driver had been working in the sector for more than five years, indicating a relatively experienced workforce. The majority of drivers (55.35%) had 4-6 years of experience, while 15.90% had 1-3 years and 9.79% had 10 or more years of experience.

A noteworthy finding is that nearly 87% of drivers own their tricycles. This indicates a level of financial investment in the business, suggesting a potential economic stake in the success of their livelihood. This ownership could also influence their attitudes towards EFM adoption, as any additional costs associated with the technology may directly impact their financial situation.

Current Fare Structure

The survey data in this section reveals insights into the current fare structure used by tricycle drivers in Cabanatuan City.

The most common fare system is based on distance, with 74% of drivers relying on this method. A significant portion of drivers (26%) use a combination of distance-based fares and negotiation with each passenger. A smaller percentage (4.6%) relies solely on negotiation for fare collection. Furthermore, the majority of drivers (71.25%) serve 10-20 passengers per day. A notable portion (22.94%) serves less than 10 passengers daily, while a smaller group (5.81%) serves 20-30 passengers daily. This data suggests that a significant number of tricycle drivers may have limited ridership, potentially impacting their daily income. This, combined with the income distribution, suggests that many drivers may operate within a modest income range. The small number of riderships could be because of the number of tricycles operating within the city. Tricycle drivers spend a significant amount of time in line at their terminal, along with other drivers.

The most prevalent income range is ₱301-₱500, accounting for nearly 69% of drivers. A significant percentage (18.96%) earn between ₱501-₱1000 daily. A smaller group (12.54%) earns less than ₱300 daily. This highlights the economic vulnerability of a segment of the tricycle driver population, who may struggle with financial fluctuations and unexpected expenses.

The findings also reveal that a significant majority of tricycle drivers spend between ₱100 and ₱200 on fuel daily, accounting for over 53% of respondents. This suggests that fuel is a major operational cost for most tricycle drivers. A noteworthy finding is the

substantial percentage (42.51%) who spend less than ₱100 on daily fuel. This could be due to several factors, such as ridership, as the number of passengers carried throughout the day can influence fuel consumption. Fewer passengers may translate to lower fuel use. A smaller segment (4.28%) spends between ₱201 and ₱300 daily on fuel. The dependence on fuel and its fluctuating costs can be a source of economic vulnerability for tricycle drivers. Even a slight increase in fuel prices can significantly impact their daily profits, especially for those with lower ridership or already tight profit margins.

The findings also reveal that a significant majority (67.89%) of tricycle drivers incur monthly maintenance costs of less than ₱500. This suggests that many drivers can maintain their tricycles at a relatively low cost. However, it is important to consider the potential limitations of this finding. Older tricycles or those in poorer condition may require more frequent and expensive maintenance. Different tricycle models may have varying maintenance requirements and costs as well. Moreover, drivers who navigate rough roads or operate in a way that puts more stress on the tricycle may experience higher maintenance needs. As EFM implementation could influence driver income and potentially introduce new maintenance considerations, a comprehensive analysis of its potential impact on overall operational costs is crucial (Sadrani, Najafi, Mirqasemi & Antoniou, 2023).

Perception of Electronic Fare Meters

Table 2. Tricycle Driver's Awareness of Electronic Fare Meters

Statement	WM	VI	VD
I am aware of electronic meters being used for tricycles	3.42	Strongly Agree	The respondent is very much aware of the statement
I would be willing to adopt electronic meters for my tricycle if the economic benefits were clear	3.35	Strongly Agree	The respondent is very much aware of the statement
I am confident that I can learn to use electronic meters if there is a training program	3.47	Strongly Agree	The respondent is very much aware of the statement

Table 2 provides valuable insights into the awareness and receptiveness of tricycle drivers in Cabanatuan City towards electronic fare meters. The data reveals a strong level of awareness regarding fare meters among tricycle drivers. A significant portion of respondents (over 3.4 on a 4-point scale for all statements) strongly agreed with being aware of electronic meters being used for tricycles. This suggests that tricycle drivers are not unfamiliar with the concept of fare meters. While drivers demonstrate awareness, their willingness to adopt fare meters appears to be contingent on economic benefits. Their strong agreement (over 3.3) with adopting meters if economic benefits are clear suggests a pragmatic approach. Drivers are likely open to electronic fare meters if they perceive a tangible financial advantage. The strong agreement (over 3.4) with the statement regarding confidence in learning to use fare meters with proper training programs indicates a positive attitude towards adapting to the technology. Drivers seem receptive to acquiring the necessary skills if adequate support is provided.

Table 3 offers valuable insights into how tricycle drivers in Cabanatuan City perceive the potential benefits of electronic fare meters. Drivers strongly agree (over 3.3 on a 4-point scale) that electronic fare meters could ensure fairer fares for both themselves and passengers. This suggests a recognition of potential issues with the current fare structure, possibly including fare negotiation disputes or a lack of transparency. Fare meters, with their standardized fare displays and clear billing systems, are seen as a solution to promote fairness in fare collection. A significant agreement (over 3.4) exists regarding the potential of fare meters to improve passenger trust in tricycle drivers, leading to higher ridership. Drivers strongly agree (over 3.4) that fare meters could make fare collection easier and faster. This suggests a

potential benefit in terms of operational efficiency, allowing them to spend less time on transactions and more time serving passengers. While drivers acknowledge the potential benefits of fare meters, their strong agreement (over 3.3) with the need for a government subsidy suggests a concern regarding the initial cost of acquiring and installing the technology. Financial incentives appear to be a crucial factor for wider driver adoption. These findings align with technology acceptance models that emphasize perceived usefulness and ease of use as key drivers of adoption (Venkatesh et al., 2003)

Table 3. Tricycle Drivers' Perceived Benefits of Electronic Fare Meters

Statement	WM	VI	VD
I believe electronic meters could help ensure fairer fares for both drivers and passengers.	3.37	Strongly Agree	The respondent viewed the statement as highly agreeable
Electronic meters could improve passenger trust in tricycle drivers, leading to potentially higher ridership.	3.42	Strongly Agree	The respondent viewed the statement as highly agreeable
Electronic meters would likely make it easier and faster for me to collect fares from passengers.	3.43	Strongly Agree	The respondent viewed the statement as highly agreeable
Data from electronic meters could help me optimize my routes and potentially save on fuel costs.	3.40	Strongly Agree	The respondent viewed the statement as highly agreeable.
I will be more willing to adopt electronic meters if there is a government subsidy.	3.35	Strongly Agree	The respondent viewed the statement as highly agreeable.

Table 4. Tricycle Drivers' Concerns on Electronic Fare Meters

Statement	WM	VI	VD
I am concerned about the upfront cost of acquiring and installing electronic meters.	3.47	Strongly Agree	The respondent viewed the statement as highly concerning
I am worried that electronic meters might lead to lower fares due to the regulation	3.32	Strongly Agree	The respondent viewed the statement as highly concerning
I am concerned that some passengers might resist using electronic meters and prefer negotiated fares.	3.34	Strongly Agree	The respondent viewed the statement as highly concerning
I am concerned that installing electronic meters would incur additional maintenance costs.	3.38	Strongly Agree	The respondent viewed the statement as highly concerning
I believe the government or tricycle driver associations should provide financial assistance to offset the cost of electronic meters.	3.51	Strongly Agree	The respondent viewed the statement as highly concerning.

Table 4 shows the key concerns tricycle drivers in Cabanatuan City hold regarding the implementation of electronic fare meters. Drivers strongly agree with concerns about the upfront cost of acquiring and

installing electronic fare meters. This highlights a potential financial barrier to driver adoption, especially for those with limited resources. The strong agreement with the need for financial assistance from the government or tricycle driver associations further emphasizes the financial burden associated with electronic fare meter adoption. Drivers seem to seek support in mitigating these upfront costs. While some drivers perceive potential benefits in fare fairness, a significant portion (over 3.3) also express concern that meters might lead to lower fares due to regulation. This suggests a fear of potential income reduction under a standardized fare system. Drivers show concern regarding potential additional maintenance costs associated with installing fare meters. This suggests a fear of unforeseen expenses related to maintaining the new technology. Studies on technological change in transportation sectors highlight the importance of mitigating driver concerns and ensuring a just transition (Shaheen et al, 2012)

IV. CONCLUSION AND RECOMMENDATIONS

Conclusion

1. The driver population is predominantly male with an average age of 42, and relatively experienced with the most common age group being 31 – 40 years old. Notably, 87% of the respondents owned their tricycles, indicating a financial stake in their vehicles. The majority of the drivers rely on a distance-based fare system with a significant portion using a combination of distance and negotiation for fares. Passenger ridership varies, with most drivers serving 10-20 passengers daily. The data on the survey revealed a modest income range for a significant portion of tricycle drivers, with many relying on daily earnings between ₱301-₱500. Fuel costs represent a major operational expense, with most drivers spending between ₱ 100 and ₱200 daily. Monthly maintenance costs vary depending on factors like tricycle age and condition, but a substantial portion maintain their tricycles for less than ₱500 monthly.

2. The survey results indicate a high level of awareness regarding fare meters among tricycle drivers in Cabanatuan City. However, their willingness to adopt the technology appears conditional. Drivers seem open to electronic fare meters if clear economic benefits, such as increased efficiency and fairer fares, are demonstrated. Strong agreement exists with the need for training programs to ensure a smooth transition and build confidence in using fare meters. Overall, driver perceptions suggest a pragmatic approach – they are open to technological change if it translates to a positive impact on their livelihoods.

3. Drivers recognize the potential of fare meters to promote fairness in fare collection for both themselves and passengers by eliminating negotiation and implementing standardized fares. The transparency and legitimacy associated with fare meters could incentivize passengers to choose tricycles more frequently leading to potentially higher ridership and improved driver income. However, the initial cost of acquiring and installing fare meters is a major concern for drivers, particularly those with limited resources. Financial assistance from the government or tricycle associations is seen as crucial for wider adoption. While some drivers perceive potential benefits in fare fairness, a concern exists that fare meters might lead to lower fares due to regulation.

4. Based on the analysis of the landscape and driver perceptions, the overall economic suitability of fare meter implementation for tricycle drivers in Cabanatuan City is low. While the technology offers potential economic benefits like increased efficiency, fairer fares and potentially higher ridership, significant challenges can hinder adoption. Upfront costs of acquiring and installing electronic fare meters create a financial barrier for many drivers. Concerns also exist regarding lower fares due to regulation, potentially impacting driver income negatively.

Recommendations

For Policymakers and Stakeholders. Establish a clear and transparent fare-setting process that considers operational costs, driver income sustainability, and passenger affordability. Communicate the rationale behind fare regulations effectively to both drivers and passengers. Organize workshops and consultations with tricycle driver associations to gather detailed feedback on their concerns and preferences when it comes to their livelihood. Explore alternative fare structures that balance passenger affordability with driver income sustainability.

For Future Researchers. Conduct a comprehensive cost-benefit analysis that considers not only the upfront costs of electronic fare meters but also the potential long-term economic benefits for drivers, passengers, and the government.

By addressing these areas for further exploration, policymakers and stakeholders can make informed decisions about electronic fare meter implementation. This research approach will ensure a more comprehensive understanding of the potential economic and social implications, paving the way for a more sustainable and equitable tricycle transportation system in Cabanatuan City in the future.

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