Partial Analysis on The Viability of The Intelligent Transportation System (Its) In San Fernando, Pampanga Through the Perspective of The Law Enforcers and Jeepney Drivers

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Abstract: - Transportation engineering necessitates the management of the mode of transportation, which provides a safe, comfortable, convenient, economical, and environmental-friendly system for people and goods. Hence, the focus of interest of this study, titled "Partial Analysis on the Viability of the Intelligent Transportation System (ITS) in San Fernando, Pampanga through the Perspective of the Law Enforcers and Jeepney Drivers." The researchers aimed to partially analyze the city's viability from the viewpoint of law enforcers and jeepney drivers and determine the effects of traffic congestion and variables that affect the performance and efficiency of the current traffic management system. The study used a quasi-experimental research design, proving that independent and dependent variables have cause-and-effect connections. Eighty-one respondents (81) answered the survey questionnaire – 59 respondents from San-Agustin – San-Isidro – CSFP jeepney drivers and 22 from LTO-CSFP law enforcers. The research instruments used were survey questionnaires and structured interviews. The quantitative data were treated with the Relative Importance Index (RII), Percentage Frequency Distribution, Likert Scale, Range of Mean, and Pearson's Correlation Coefficient. While qualitative data were transcribed, content examined, and classified. Accordingly, traffic congestion decelerated the flow of goods, increased travel time and fuel costs, and contributed to air pollution. The behavior of road users, the condition and characteristics of the road infrastructure, and existing vehicles are the elements that affect the production and efficiency of the current traffic management system of the city. Meanwhile, regarding the characteristics of ITS, jeepney drivers are more well-informed than law enforcers. The viewpoints of the law enforcers and jeepney drivers to ITS are distinct yet give different mastery. The first stage of this analysis is done, and future researchers are urged to incorporate public users to complete the three fundamental components of ITS and officially accomplish this study.

Key Words— ***Partial Analysis, Viability, Intelligent Transportation System (ITS), Perspective.***

I. INTRODUCTION

Accidents occur in unexpected situations and circumstances.

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Most of the cases are road-related accidents. Not only because many different vehicles are moving on the road, but also various causes such as people and animals crossing the road, minor setbacks of roads near the surrounding buildings, ongoing infrastructure on the street and sidewalk constructions, and others. In the Philippines, several variables cause traffic accidents, such as road conditions and weather concerns.

According to the analysis by Kim (2020), the most prevalent causes of road accidents in the nation include excessive speed, driving while drunk, outdistance, unlawful turning, and crossing the road.

Consequently, several accidents were recorded in Pampanga, such as vehicle-related accidents – injuries, and worst, death. The application of Traffic Management System and Intelligent Transportation System (ITS) was used in the study to lessen these occurrences. Traffic management refers to actions designed to keep traffic flowing while improving the system's safety and dependability. These indicators track how Intelligent Transportation System (ITS), services, and projects are used in daily operations to influence road network performance. ITS intends to add and apply information and communication technology to transport infrastructure, vehicles, and people to improve the safety, reliability, efficiency, and quality of transportation.

Transportation models can be categorized in a variety of ways. The models are continuously considered depending on the different factors of the generation – technological advancement, methodological principles, and practical requirements. By summing up what has been accomplished in the previous generation, the study can anticipate what can be intended in future generations (e.g., the next 30 years) of transportation means, taking into account some promising ITS technologies that are currently being or will be implemented in the future. The preceding generations of transportation models were driven and pushed by considerable technological advancements in the industry and information science and the ever-increasing desire for more profitable and well-ordered transportation networks (Crawford, 2021).

With greater connection, automation, and optimization, these new ITS technologies have the potential to radically alter the features of existing transportation systems, resulting in a system that is much more user-centric, system-optimal, secure, and sustainable. According to Speier and Wallace (2019), this system will be the first step toward encouraging and pushing transportation experts to develop future transportation models. It will benefit millions of people who utilize public transportation with a general objective of improving the safety of commuters, drivers, riders, or daily travelers, both public and private vehicles, by applying Intelligent Transportation System (ITS). This system may help improve traffic management, leading to the city's economic progress.

Intelligent Transportation System (ITS) should be conducted and studied within the following timeframe because it enhances emergency and traffic management services, electronic and wireless toll payment, incident prevention management, traveler data services, digital fare fee, freeway maintenance, transportation management, traffic signal regulation, railroad level passing and secured pedestrian grade crossing safety (Pina, 2020). According to Mousel (2017), the usage of the transportation system has made life in the world simpler. Transportation has progressed throughout the years; hence, it is valuable since humans rely on transportation to convey and do everyday operations. The specific objectives of the system were: to delimitate the occurrence of accidents happening on the road networks, improve the public transportation safety for the commuters, convert and increase the public transportation's comfortability, reliability, and efficiency, and associate the transportation system of the city in the continuously growing economy of the city which will lead to alleviation of traffic congestion where public and private cars also uninterruptedly grow in its numbers. Moreover, acquiring the current data of the perspectives of the law enforcers and jeepney drivers in the city regarding the current transportation management system of the City of San Fernando, Pampanga, and adapting the ITS in its system is also the objective of this study. These objectives of the system were identified due to the unforeseen improvements in the transport system and roadways of the major road networks in areas. This analysis used a quasi-experimental research design to measure the needs of CSFP in improving its transportation management system to acquire the stated goals. This study significantly contributed to public transportation users of the city, community safety, organization, and ecological sustainability.

The study benefits the road users, community, and area scope. This research aimed to elevate the service of the transportation system's efficiency, security, and safety of transportation networks; it enhanced information, communication, and control technology. The area's transportation system was beneficial in reducing traffic congestion, enhancing traffic management, reducing environmental impact, and improving transportation for business customers and the public. The study became a bridge to a transportation network that satisfied the accessibility and mobility of those living and working in the region. Thus, people will experience a safe, cost-effective, dependable, convenient, and environmental-friendly transportation system. Furthermore, it opened doors of opportunities that became the platform for upgrading the technology and transportation system in the city.

II. METHODOLOGY

This part of the study discusses the research method used by the researchers. It is also a preliminary step in accepting Intelligent Transportation System (ITS) in City of San Fernando, Pampanga. The researchers collected data from relevant resources and they are the 59 respondents from San Agustin-San Isidro CSFP jeepney drivers and 22 respondents from Land Transportation Office – City of San Fernando, Pampanga law enforcers.

In getting the sample size of the respondents, the researchers used Krejcie and Morgan Formula. The ever-increasing demand for research has necessitated a technique for calculating the sample size required to be representative of a particular population. The research section of the National Education Association has released formula for determining sample size in the paper titled "Small Sample Techniques." The Krejcie and Morgan Table Formula for calculating the sample size of the study is

$$s = \frac{X^2NP(1-P)}{d^2(N-1)+X^2P(1-P)}$$

Where: s is the required sample size, X^2 is the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841), N is the population size, P is the population proportion (assumed to be 0.50 since this would provide the maximum sample size.), d is the degree of accuracy expressed as a proportion (0.05) and 1 is from the article "Small Sample Techniques."

The total population of jeepney drivers from the San Agustin-San Isidro CSFP is 70, while the law enforcers from the LTO-CSFP are 23 based on the area scope of the study. Consequently, by using the abovementioned formula in determining the sample size, the number of respondents in this study would manifest a value of

$$s = \frac{X^2NP(1-P)}{d^2(N-1)+X^2P(1-P)}$$

$$= \frac{(3.841)(70)(0.50)(1-0.50)}{[(0.05^2)(70-1)+(3.841)(0.50)(1-0.50)]}$$

= 59 respondents from San Agustin-San Isidro CSFP jeepney drivers

$$s = \frac{X^2NP(1-P)}{d^2(N-1)+X^2P(1-P)}$$

$$= \frac{(3.841)(23)(0.50)(1-0.50)}{[(0.05^2)(23-1)+(3.841)(0.50)(1-0.50)]}$$

= 22 respondents from law enforcers of LTO-CSFP

The researchers chose jeepney drivers of San Agustin – San Isidro – CSFP as their respondents since the jeepney is one of the primary transportation means in the Philippines. Additionally, jeepney drivers from the specified area are the only jeepney drivers that travel within the vicinity of the City of San Fernando, Pampanga. Jeepneys, popularly known as "Kings of the Road," are a key transportation method for most Filipinos. In regions around the Philippines, public transportation facilitates mobility, access to community services, employment, healthcare, and recreational activities. Due to its cheap fare, it is convenient for commuters and those who own a vehicle. Jeepneys symbolize Filipino culture and are an essential means of transportation (Buncaras, Conquilla, Ranis, and Tus, 2021).

Also, the researchers selected law enforcers of LTO-CSFP as one of their participants for the reason that law enforcers have transportation knowledge. To enhance the knowledge of the law enforcers, the Metropolitan Manila Development Authority (MMDA) provides a Traffic Management Course for Traffic Law Enforcement Officers (LEOS) of Local Government Units: Basic Course. This course examines the essential ideas and principles of traffic management necessary to grasp the land transportation system in the Philippines, specifically in Metro Manila. It comprises modules for traffic law enforcement officials from local and/or national governments, road safety practitioners, traffic and transportation experts, emergency responders and rescue workers, and safety and security specialists. The preceding are the minimum prerequisites for admission: must have a background in traffic and transportation management; should be physically fit and be officially authorized by their immediate Head and/or City/Municipality; Mayor in the case of LGUs (GOVPH, 2015).

The researchers analyzed and examined the study site and determined that the research would be viable in the study area. The researchers used quasi-experimental research design in the study. Quasi-experimental research design was utilized to prove that an independent variable has a cause-and-effect connection. It is a valuable technique when genuine experiments are impossible due to ethical or practical concerns.

III. RESULTS AND DISCUSSIONS

3.1 Results

In this section of the study, the results and outcomes of the analysis are defined and they are followed by discussions. The results are analyzed using the data collected

from the survey's respondents and the relevant statistical techniques for the investigation. To further illustrate the results, graphs and tables are employed. Accessibility, mobility, quality of life, operational efficiency, and system condition and performance are among the study's indicators.

Table.1. Overall Average of Current Transportation Management System

Part	Jeepney Drivers	Law Enforcers
Accessibility	4.95480226	4.95480226
Mobility	4.372881356	4.372881356
Quality of Life	3.88700565	3.88700565
Operational Efficiency	4.508474576	4.508474576
System Condition and Performance	4.926553672	4.926553672

Table.2. Overall Average of Intelligent Transportation System

Part	Jeepney Drivers	Law Enforcers
Mobility	4.937853107	2.378787879
Safety	4.435028249	3.909090909
Environmental	4.299435028	4.257575758

In summary, shown in tables 1 and 2 is the relation of responses of the San Agustin-San Isidro jeepney drivers and law enforcers of Land Transportation Office – City of San Fernando, Pampanga. Based on the overall answers of the respondents in the study, the level of awareness of the drivers and law enforcers in the current transportation management system of CSFP is at the same level of understanding. Both groups of respondents have shown similarity in their understanding and awareness of the accessibility, mobility, quality of life, operational efficiency, and system condition and performance of the city's transit system today. However, the two groups' understanding of the Intelligent Transportation System differs from one another. Jeepney drivers and law enforcers of LTO-CSFP understands or have knowledge in terms of the features offered by the ITS. Out of the three (3) categories under ITS, mobility, safety, and environmental, both groups have agreed that ITS has a significant effect on the environmental effects of ITS to the city's transportation system.

Table 3. Pearson's Correlation Coefficient of the Current Transportation Management System of City of San Fernando, Pampanga

Part	Jeepney Drivers (X)	Law Enforcer (Y)	XY	X^2	Y^2	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	r	df	A	Table r	P-Value
Accessibility	4.9548	4.7727	23.6479	24.5501	22.7789	0.4249	0.3788	0.1609	0.1805	0.1435	-0.12743	3	0.05	0.878339	0.838734
Mobility	4.3729	4.4242	19.3467	19.1221	19.5739	-0.1571	0.0303	-0.0048	0.0247	0.0009					
Quality of Life	3.8870	4.5606	17.7271	15.1088	20.7991	-0.6429	0.1667	-0.1072	0.4134	0.0278					
Operational Efficiency	4.5085	4.1212	18.5804	20.3263	16.9844	-0.0215	-0.2727	0.0059	0.0005	0.0744					
System Condition and Performance	4.9266	4.0909	20.1541	24.2709	16.7355	0.3966	-0.3030	-0.1202	0.1573	0.0918					

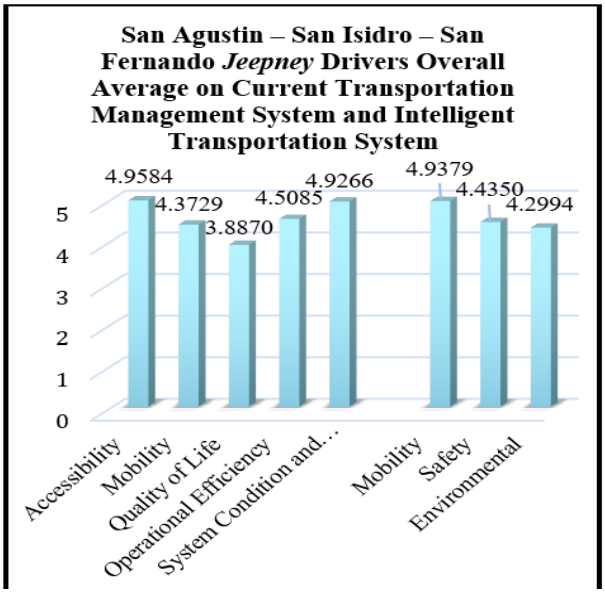

Fig.1. San Agustin – San Isidro – San Fernando Jeepney Drivers Overall Average on Current Transportation Management System and Intelligent Transportation System

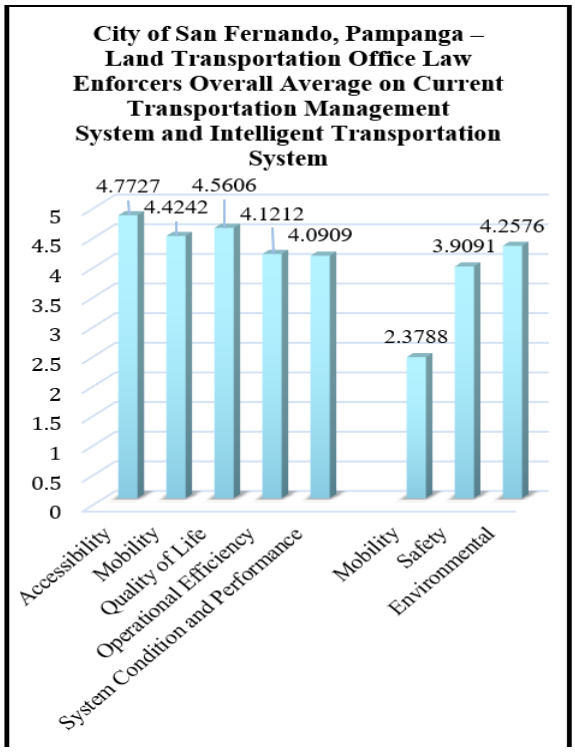

Fig.2. City of San Fernando, Pampanga – Land Transportation Office Law Enforcers Overall Average on Current Transportation Management System and Intelligent Transportation System

Figures 1 and 2 are the overall average of the San Agustin-San Isidro CSFP jeepney drivers and Land Transportation Office – City of San Fernando, Pampanga law enforcers on Current Transportation Management System and Intelligent Transportation System. The figure shows that the LTO-CSFP law enforcers have more knowledge than the San Agustin-San Isidro CSFP jeepney drivers on the current transportation management system. On the other hand, the San Agustin-San Isidro CSFP jeepney drivers and LTO-CSFP law enforcers understands the characteristics of the Intelligent Transportation System.

Presented in Table 3 is the Pearson's Correlation Coefficient of the Current Transportation Management System of the City of San Fernando, Pampanga, through the perspective of the Law Enforcers and Jeepney Drivers. It provides the values of mean, Pearson's Coefficient (r), degrees of freedom (df), significance level or alpha value (α), critical value based on Pearson's Correlation Table (table r), and p-value computed by the P-value from the Pearson's (R) Calculator of Social Science Statistics in order to strengthen the accuracy of the obtained critical value and the conclusion of the hypothesis.

From sample data, it is determined that the sample means are:

$$\bar{x}1 = 4.5299$$

$$\bar{x}2 = 4.3939$$

Pearson Coefficient (r) is:

$$r = -0.12743 \text{ (no correlation)}$$

The degree of freedom (df) is:

$$df = 3$$

Significance level or alpha value (α) is:

$$(\alpha) = 0.05$$

Critical Value (table r) and p-value are:

$$\text{table } r = 0.878339$$

$$\text{p-value} = 0.838734$$

The following null and alternative hypotheses need to be tested:

$$Ha: r \leq \text{table r}, Ha: r \leq \text{p-value}$$

$$Ho: r \geq \text{table r}, Ho: r \geq \text{p-value}$$

This corresponds to a one-tailed test, wherein Pearson's Correlation Coefficient was used.

The Pearson Coefficient is (r) = -0.12743, and the

critical value is table r = 0.878339. Since table r is greater than or equal to the Pearson Coefficient (r), it is concluded that the null hypothesis (Ho) is accepted. Using the P-value approach: The p-value is p = 0.838734, and since p = 0.838734 > 0.05, it is also determined that the null hypothesis is accepted.

Presented in Table 3 is the Pearson's Correlation Coefficient of the Current Transportation Management System of the City of San Fernando, Pampanga, through the perspective of the Law Enforcers and Jeepney Drivers. It provides the values of mean, Pearson's Coefficient (r), degrees of freedom (df), significance level or alpha value (α), critical value based on Pearson's Correlation Table (table r), and p-value computed by the P-value from the Pearson's (R) Calculator of Social Science Statistics in order to strengthen the accuracy of the obtained critical value and the conclusion of the hypothesis.

From sample data, it is determined that the sample means are:

$\bar{x}1 = 4.5299$

$\bar{x}2 = 4.3939$

Pearson Coefficient (r) is:

r = -0.12743 (no correlation)

The degree of freedom (df) is:

df = 3

Significance level or alpha value (α) is:

(α) = 0.05

Critical Value (table r) and p-value are:

table r = 0.878339

p-value = 0.838734

The following null and alternative hypotheses need to be tested:

Ha: r ≤ table r, Ha: r ≤ p-value

Ho: r ≥ table r, Ho: r ≥ p-value

This corresponds to a one-tailed test, wherein Pearson's Correlation Coefficient was used.

The Pearson Coefficient is (r) = -0.12743, and the critical value is table r = 0.878339. Since table r is greater than or equal to the Pearson Coefficient (r), it is concluded that the null hypothesis (Ho) is accepted. Using the P-value approach: The p-value is p = 0.838734, and since p = 0.838734 > 0.05, it is also determined that the null hypothesis is accepted.

Table 4. Pearson's Correlation Coefficient of the Development of Intelligent Transportation System in City of San Fernando, Pampanga

Part	Jeepney Drivers (X)	Law Enforcer (Y)	XY	X^2	Y^2	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	r	df	α	Table r	P-Value
Mobility	4.9379	2.3788	11.7461	24.3824	5.6586	0.3804	-1.1364	-0.4323	0.1447	1.2913	-0.99962	1	0.05	0.996917	0.028473
Safety	4.4350	3.9091	17.3369	19.6695	15.2811	-0.1224	0.3939	-0.0482	0.0150	0.1552					
Environmental	4.2994	4.2576	18.3052	18.4851	18.1272	-0.2580	0.7424	-0.1915	0.0666	0.5512					

Acceptance of the null hypothesis is obtained as a conclusion. Furthermore, there is credible evidence to conclude that there is no significant relationship between the awareness of the adequacy of the current transportation management system in CSFP.

Presented in Table 4 is the Pearson's Correlation Coefficient of the Development of Intelligent Transportation System in the City of San Fernando, Pampanga, through the perspective of the Law Enforcers and Jeepney Drivers. It provides the values of mean, Pearson Coefficient (r), degrees of freedom (df), significance level or alpha value (α), critical value based on Pearson's Correlation Table (table r), and p-value computed by the P-value from the Pearson (R) Calculator of Social Science Statistics in order to strengthen the accuracy of the obtained critical value and the conclusion of the hypothesis.

From sample data, it is determined that the sample means are:

$$\bar{x}1 = 4.5574$$
$$\bar{x}2 = 3.5152$$

Pearson Coefficient (r) is:

$$r = -0.99962 \text{ (perfect negative correlation)}$$

The degree of freedom (df) is:

$$df = 1$$

Significance level or alpha value (α) is:

$$(\alpha) = 0.05$$

Critical Value (table r) and p-value are:

$$\text{table } r = 0.996917$$
$$\text{p-value} = 0.028473$$

The following null and alternative hypotheses need to be tested:

$$Ha: r \leq \text{table } r \text{ , } Ha: r \leq \text{p-value}$$
$$Ho: r \geq \text{table } r \text{ , } Ho: r \geq \text{p-value}$$

This corresponds to a one-tailed test, wherein Pearson's Correlation Coefficient was used.

The Pearson Coefficient is (r) = -0.99962, and the critical value is table r = 0.996917. Regardless of the sign convention, Pearson Coefficient (r) is greater than or equal to table r, it is concluded that the null hypothesis (Ho) is rejected. Using the P-value approach: The p-value is p = 0.028473, and since p = 0.028473 < 0.05, it is also determined that the null hypothesis is rejected.

The null hypothesis has been rejected in conclusion. Furthermore, there is adequate information to conclude that there is a significant relationship between the knowledge in the viability of the Intelligent Transportation System.

IV. Discussions

The purpose of the study was to partially analyze the viability of the Intelligent Transportation System (ITS) in San Fernando, Pampanga, from the perspective of the law enforcers and jeepney drivers. The study's participants were fifty-nine (59) jeepney drivers from San Agustin–San Isidro–City and twenty-two (22) law enforcers from the Land Transportation Office of San Fernando, Pampanga. All participants in this research were male. Their ages varied from 24 to 60, with the preponderance falling between 30 and 40. This is because most drivers and law enforcers were males and were involved in this type of work during the survey period.

Concisely, the researchers investigated and correlated the current transportation management system with the intelligent transportation system. Law enforcers and jeepney drivers were "extremely aware" of the current transportation management system regarding accessibility, mobility, operational efficiency, and system and condition performance. On the other hand, the specified participants were "Moderately Aware" of their quality of life. On the part of the Intelligent Transportation System, law enforcers and jeepney drivers have different knowledge regarding the indicators. Regarding mobility, safety, and environmental impact, most of the jeepney drivers answered "very knowledgeable."

On the contrary, most law enforcers answered "Somewhat Knowledgeable" on ITS in mobility. Law enforcers know ITS in terms of safety. In addition, they have high knowledge of the environmental impacts of ITS.

Drivers and law enforcers must be aware of and knowledgeable about road transportation. According to Torosyan (2018), the driver's training system's quality is largely connected to road traffic safety. A high percentage of accidents indicates a lack of knowledge in the drivers' training. The classification of a road user is determined depending on his/her training organization and the ability to formulate the correct driving skills. Diaz (2021) stated that traffic enforcement officers' main goals were to ensure motorists' safety and create mobility for pedestrians. They

were responsible for keeping the roadways moving during delays like sporting events, parades, and congestion during rush hours and providing better and safer mobility for pedestrians.

The study's findings also revealed that there was no significant difference in the awareness of the adequacy of the current transportation management system in the City of San Fernando, Pampanga ($r = -0.12743$; $df = 3$; $\alpha = 0.05$; table $r = 0.878339$ and $p = 0.838734$) and the Pearson Coefficient did not correlate. On the other hand, there was a significant difference in the knowledge of the viability of the Intelligent Transportation System ($r = -0.99962$; $df = 1$; $\alpha = 0.05$; table $r = 0.996917$ and $p = 0.028473$) and the Pearson Coefficient has a perfect negative correlation.

V. Conclusions

Generally, the researchers have concluded that a city must have an adequate transportation system because it significantly impacts people, businesses, the environment, and the economy. Additionally, an efficient and sustainable transportation system can help people access employment, foster innovation, cities' and nation's economic growth; design greener and healthier areas; and support cities in attracting new businesses. Intelligent Transportation System (ITS) is an example of a transportation system, and it improved emergency and traffic management services, electronic and wireless toll payment, incident prevention management, traveler information services, electronic fare fee, freeway management, transit management, traffic signal regulator, railroad level passing and secured pedestrian grade crossing safety in another country and some cities in the Philippines.

Specifically, the researchers found out that the jeepney drivers from San Agustin-San Isidro – City of San Fernando, Pampanga, and law enforcers from the Land Transportation Office of the City of San Fernando, Pampanga have sufficient existing knowledge of the current transportation management system of the city, and their brief knowledge on what Intelligent Transportation System (ITS) brings to the transport system of the city. Both groups of respondents have the same level of knowledge regarding the existing traffic management system and have a similar awareness and understanding of the accessibility, mobility, quality of life, operational efficiency, and system condition and performance of the current transportation system in the city. On the other hand, the two groups understand or have knowledge regarding the perceptions of Intelligent Transportation System. Moreover, out of the three (3) categories under ITS, mobility, safety, and environmental, the effects of ITS on the city's transportation system in terms of environmental were agreed upon by both groups.

Consequently, the responses of the participants in the study have accumulated a verbal interpretation of "Extremely Aware" and "Knowledgeable" in terms of the Mobility of the current transportation management system of the City of San Fernando, Pampanga (CSFP) and Intelligent Transportation System (ITS). The mobility of an area is being impeded and slowed down by several factors going within the city. Traffic congestion is one of the results brought by these factors affecting the city's mobility. This traffic congestion slows down the flow of goods, increases travel time, increases fuel cost, and aggravates air pollution. Despite the jeepney drivers grading the current transportation management of the city having a smooth flowing system, still, there is ongoing traffic congestion in different parts of the roads within the city. In line with this, the law enforcers from the LTO-CSFP were "Slightly Knowledgeable" in the ITS Mobility System. On the contrary, traffic congestion within the city continuously happens due to unlawful and unorganized activities within the road networks, such as illegal parking, illegal boarding and alighting, and road condition in different parts of the city.

The researchers also analyzed and determined the variables that affect the performance and efficiency of the current traffic management system of the city. San Agustin – San Isidro – City of San Fernando, Pampanga jeepney drivers and Land Transportation Office – City of San Fernando, Pampanga law enforcers, are "Extremely Aware" of the current traffic management system of CSFP in terms of accessibility, mobility, quality of life, operational efficiency, and system condition and performance. The researchers concluded that the factors influencing the performance and efficiency of the current traffic management system of the city include:

- The behaviour of road users.
- The condition and characteristics of the road infrastructure.
- Existing vehicles.

Additionally, in an interview with the city engineer of the City of San Fernando, Pampanga, the researchers asked questions regarding the city's transportation system. They

conversed about traffic management, the city's demographic profile, how many registered vehicles were there, mortalities in accidents, road occurrences, and plans for the city in the next five (5) to ten (10) years.

The city engineers also mentioned that the Lazatin Flyover was damaged and had less skid, but the office had already talked to the Department of Public Works and Highways (DPWH) about repairing the said bridge. Currently, the Traffic Division Office of the CSFP is monitoring the dysfunctional stoplight on St. Jude Street along Mc Arthur Highway. In addition, the said portion of the highway is currently under construction, which is also the reason for discomfort in the service of the roadway. The city engineers also mentioned that the morning rush hour starts at 7:30 AM-8:30 AM, while in the evening, it builds up at 5:30 PM-6:00 PM. Also, the engineer talked about safety – they were recording the accidents in the city. Regarding the environmental impact, Brgy. San Agustin released E-Jeepneys and these jeepneys would help in air pollution.

As per the city engineer, more accidents happen on wider roads. Four-wheeled vehicles or private vehicles were the types of vehicles that were always involved in accidents. These accidents were usually caused by human error – inconsistency of the road and the illumination at night were some of the causes of accidents. About the mortalities, large trucks run over single motors, where the accident happens. In terms of damages to property, drivers accidentally crashed into barriers in the middle of the road. Regarding the accidents that occur annually, the city recorded 800 (average) accidents that happen every year. This was from the year 2020 up to November 2021.

Regarding the city's plans for the following years, the city engineer stated that during an infrastructure is being built. He proposes a rerouting scheme where vehicles can safely pass and travel. He also added that if a project has started, there were changes during the execution of the plan. He has a plan for the public transportation of the city, specifically, the renovation of terminals and the promotion of bike lanes that endorse active transport.

The researchers and the city engineer also conversed about the modernization of public transportation. The city engineer specified that Jeepney Operators Drivers Association (JODA) opposes the jeepney modernization program because these types of jeeps are costly and cannot afford them.

The researchers asked about Intelligent Transportation System (ITS), their research topic. The city engineer said that he had limited knowledge about it. Furthermore, he has a plan that accelerates the violators' process though they were considered drivers. He also wants to propose the Non-Contact Apprehension in the city wherein it is a policy that employs CCTV, digital cameras, and/or other devices or technology to capture videos and images of vehicles that violate traffic laws, rules, and regulations.

Consequently, through the perspective of the law enforcers and jeepney drivers, the researchers concluded that Intelligent Transportation System (ITS) is viable in the City of San Fernando, Pampanga (CSFP) since the current transportation management system of the city and the ITS has a significant relationship. As stated by the City of San Fernando (2015), the transportation management system of the city is facing several problems. Concerning these situations, ITS will greatly help the city's transportation system. Kumar (2020) stated that 37 countries adopted ITS and these countries proved the efficiency of the system. Locally, Manila, Cebu, and Davao are under construction to become a "Smart City" (Giray, 2022). Mckinsey (2022) specified that building a smart city promotes safer, healthier and more interactive areas for individuals and industries. In addition, a smart city promotes technological advancement, and it ensures a great number of advantages and benefits. The researchers believed that ITS would significantly help the City of San Fernando, Pampanga's transportation management system due to its numerous advantages.

The increasing population of drivers and commuters has contributed to a massive effect on transportation, vehicle-related phenomena, accidents, injuries, and worst, deaths. Transportation experts are continuing to study the transportation systems in a certain city and find ways to apply this in a specific area efficiently. If people cannot determine what causes a poor transportation system, the system will surely become inoperable and useless. The researchers of the study further recommend identifying the City of San Fernando, Pampanga (CSFP) 's viability in adapting the ITS to render a more effective and efficient transportation system. Moreover, the research has shown that further research and innovation in the transportation system results in fewer accidents, injuries, and deaths in support of the transportation system.

Recommendations:

After a thorough analysis of the data, the following recommendations were made:

- The researchers of the study recommend that intelligent transportation system (ITS) and their subsystems should undergo more analysis and consideration for the following reasons: (i) Identify the authorities eligible to administer and be governed by this system; (ii) Methods and technological applications that would utilize to collect and communicate data between people and authorities; and (iii) Thoroughly assess ITS subsystems to estimate their potential effect on a nation or city. Therefore, broadening one's perspectives is the optimal method for developing and adopting intelligent transportation systems.
- ITS is the application of information and communication technologies in transportation. In implementing an Intelligent Transportation System, it is vital to evaluate the technological progress state of the Philippines, especially in the City of San Fernando, Pampanga, in light of its ongoing growth. Therefore, it would establish that the advancement of technology in the nation or city must come first or whether the current level of technology in the field of study is sufficient.
- To provide compelling results and discussions, the researchers recommend applying an additional and reliable way to determine the variables' correlation. On this basis, new and higher-quality results were produced. Therefore, it would substantially impact the completion of the data necessary to determine the Intelligent Transportation System's adaptability.
- The researchers had difficulty obtaining data from the Department of Public Works and Highways (DPWH) due to limited time and the current situation: COVID19-Pandemic. Hence, future researchers should find a way to coordinate with the Department of Public Works and Highways to increase the authenticity of the information utilized in the study. The information available from DPWH will help in a more in-depth analysis of the viability of the Intelligent Transportation System (ITS) in San Fernando, Pampanga.
- The first stage in concluding this research is to conduct a partial analysis of the viability of ITS in CSFP from the perspectives of jeepney drivers and law enforcement officers. Following this, the researchers and pioneers of this study urge future researchers to incorporate the perspectives between the public users or passengers and jeepney drivers or law enforcement officers (or new Local Government Unit Officials connected to or under the Traffic Management System of the City of San Fernando, Pampanga.). Regarding public users, it is crucial to acquire their safety, service quality, and other experiences. The researchers also want to expand the number of respondents to collect more accurate data. Therefore, the three (3) fundamental components of ITS can be completed: government, enterprise, and public users. Moreover, to achieve the expected conclusions or otherwise, more studies were needed to bolster the ability and purpose of this study.

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