Barely Hanging on to the Coattails of Progress: Deep-dive into the Driving Behavior and Motivation of Public Utility Vehicle Drivers

Review of Integrative Business & Economics Research

Beata Maria de Ocampo*
De La Salle University, Manila, Philippines

Manuel Tanpoco
De La Salle University, Manila, Philippines

ABSTRACT

Congestion remains an enduring issue in cities, yet limited research has focused on analyzing driving behavior and motivation. Instead, solutions predominantly revolve around infrastructure development, traffic volume management, and implementing technological advancements. The Industry 4.0 traffic management framework emphasizes the human aspect. This sequential explanatory mixed-method study focuses on public utility vehicle (PUV) drivers in Metro Manila, their behaviors and motivations. It employs the COM-B Model and the PRIME Theory of Motivations as conceptual frameworks. The research questions are: Do Filipino PUV drivers exhibit automatic or reflective motivation in their driving behaviors under different traffic scenarios? What are the underlying factors contributing to the seemingly mindless behaviors observed among PUV drivers? The study utilized a Filipino-adapted Driver Behavior Questionnaire (DBQ) to measure drivers' behaviors followed by interviews as to underlying motivations for each behavior. The study's findings reveal that PUV drivers make more automatic than reflective driving decisions. Also, genuine concerns about the future emerged in light of technological and transportation policy changes. We recommend reassessing the PUV modernization program and its implementation to address the fundamental challenges faced by PUV drivers and develop solutions in alignment with UN SDG-1 (no poverty) and UN SDG-10 (reduced inequalities).

Keywords: Behavior-based congestion, Industrial Revolution 4.0, driver motivation, poverty alleviation.

Received 24 June 2023 | Revised 15 February 2024 | Accepted 8 April 2024.

1. INTRODUCTION

Traffic congestion is a perennial problem that burdens the economy in most bustling metropolitan cities in developing and developed countries, including the Philippines. Manila, its capital, is one of the most congested cities in the world. In 2018, the estimated congestion cost was P3.5 billion pesos a day, equivalent to an approximate annual cost of $25 billion (JICA, 2018). Comparing this to a GDP of US$328.5 billion in 2017 (Source: World Bank), congestion cost was roughly 8% of the country's GDP.

"Traffic congestion is synonymous with Metro Manila" (Gatarin, 2023).

Traffic does not just affect general productivity, but it also hurts the image of the city's capital, and the image of a city is tied to city branding efforts that affect tourism (Chan

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

et al., 2021). According to the report of the Philippine Statistics Authority, the contribution of tourism to the country's GDP is a sizeable 6.2% in 2022 (Philippine Statistics Authority, 2023).

The factors that encourage tourists' visits go beyond the quality of tourist services and destination appearance but more so the emotional experience (Rahadi et al., 2021). Imagine taking almost half an hour to travel 10 kilometers compared to just 8 minutes in Kansas City, supposedly the American city with the fastest traffic (Yu, 2024).

Asian Development Bank (2019) cites population growth and insufficient infrastructure to support urban growth as one of the major causes of congestion. However, the fundamental law of road congestion states that with the increase in road capacity through the construction of new roads and public transportation infrastructure, there will be an equivalent movement of road users, pushing the congestion levels to how it was before (Jiang, 2019). As such, many countries have undertaken creative alternatives for mitigating congestion beyond just the building of more roads through control of the number of vehicles on the road, e.g., improving public transport for commuters, providing traveler information through real-time reports on roadway conditions, making people pay for congestion costs by collecting toll fees, especially during rush hour (Litman, 2019).

However, managing the road volume is just one side of the coin, as another cause of congestion is the individual driver himself. One solution that was developed specifically to address driver behavior is the contactless apprehension system, a technology-based system wherein cameras installed in selected areas around Metro Manila would automatically detect traffic violations, the evidence of which would be included in traffic tickets sent to the violators via mail (DOST-PCIEERD, 2017). It is expected that with the associated fines, drivers would become more attentive toward avoiding traffic violations, e.g., obstructions and disregard of traffic signs, which are the top two violations in the city (MMDA, 2019). Contactless apprehension ran on for a while but has since been discontinued, and the city reverted to the traffic enforcers apprehending traffic violators. Nevertheless, is avoiding traffic violation tickets enough motivation for city drivers to be disciplined sustainably?

In this regard, the question is how much of the driving decisions made by drivers are based on a reflective thought process versus instinctual or as a matter of habit. Is it just a mindless effort to plug one's vehicle in any available gaps on the road characteristic of the properties of liquid (Cristiani et al., 2010; Greenberg, 1959), even if it will block an intersection? Or perhaps, is it a conscious "me first" attitude? Might a gridlock be prevented if one were reflective enough to stop and give way to other vehicles, especially if the flow in one's direction is not moving?

This study's objectives are: (1) to analyze how public utility vehicle (PUV) drivers are motivated to behave in response to different traffic scenarios; (2) to understand how driving capabilities affect drivers' motivation given the various traffic scenarios and; (3) to provide some data points to traffic analysts, policymakers and future researchers in developing suitable intervention strategies towards alleviating traffic congestion attributable to driver behavior.

This study focuses on the perspectives of PUV drivers, investigating their behavior and motivations. However, while the Public Utility Vehicle Modernization Program (PUVMP) forms a considerable part of the fears of PUV drivers, this study will not discuss in depth its technical details but focus on its practical implications from the analysis of inputs from authoritative websites, current events, and a subject matter expert.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

2. LITERATURE REVIEW

The most popular measurement of driver behavior originated from the Manchester Driver Behavior Questionnaire (DBQ), developed by Reason et al. (1990), wherein drivers do a self-assessment of their behaviors. The DBQ was later adapted according to various contexts in different countries to obtain insights to develop solutions in different driving populations, e.g., age, driving motivation, ethnic group differences, and personality traits (De Winter et al., 2015; Guého et al., 2014; Huang et al., 2020; Martinussen et al., 2017).

A more precise measurement of driver behavior is through sensors, cameras, and algorithms. Towards the development of self-driving cars, the details of how individual vehicles move about general traffic flow are carefully studied (De Souza et al., 2019; Jamshidnejad et al., 2017). However, an article on traffic psychology stated that emotive and motivational processes determine driver behavior and are best studied using behavioral theories (Bucchi et al., 2012).

3. THEORETICAL FRAMEWORKS

It is essential to identify behavior and analyze the motivations behind such behavior to address the issue correctly (Kok et al., 2016). For this study, the researcher employs two powerful tools for behavior modification predominantly employed in the medical sciences but are also applicable to general social sciences (Alexander et al., 2014; Courtenay et al., 2019; Muhwava et al., 2019). The COM-B model establishes the primary constructs of this study, so-named as an acronym, wherein motivation (M) sits at the heart of it, which then interacts with a person's capability (C) and opportunities (O) in the external environment to affect behavior (B) (Michie & West, 2013). As seen in Table 1, the PRIME theory of motivation provides a guide to classifying motivations behind an action, whether automatic or reflective.

Table 1: PRIME theory of motivation (West & Michie, 2020)

	Motivation	*Description*	*interpretation*
1	Maturation:	*Changes associate with growing older*	*automatic*
2	Habituation	*Decrease in response with exposure*	*automatic*
3	Sensitization	*Increase in response with exposure*	*automatic*
4	Chemical 'insult'	*Pharmacological responses*	*automatic*
5	Physical 'insult'	*Brain lesions*	*automatic*
6	Associative learning	*Operant and chemical conditioning*	*automatic*
7	Imitation:	*Direct copying*	*automatic*
8	Perception	*Acquiring information from the senses*	*automatic*
9	Identification	*Forming one's own identity from perceptions of others*	*automatic*
10	Consistency disposition	*Generation of motives, ideas from similar ones*	*automatic*
11	Dissonance avoidance	*Negating or blocking uncomfortable thoughts*	*automatic*
12	Objectification	*Generating evaluations from likes and dislikes*	*automatic*
13	Assimilation	*Acquiring information via communication*	*reflective*
14	Inference	*Induction and deduction*	*reflective*
15	Analysis	*Formal and informal calculation*	*reflective*

The main hypothesis in this research is:

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

H_0: PUV drivers are motivated automatically in their manifestation of driving behaviors.

4. METHODOLOGY

This explanatory sequential mixed method study involved a quantitative study in the first phase, wherein the results informed the type of participants purposely selected for the second phase to provide more insights (Creswell, 2014).

Phase 1 was a quantitative study of 423 Metro Manila drivers building on previous research conducted by the researchers (De Ocampo, Tanpoco & Llave, 2022) to measure and analyze behavior using Gueho et al.'s (2014) Driver Behavior Questionnaire (DBQ), previously validated to fit the Philippine context. The survey was conducted online and face-to-face to adapt to different situations of private and public vehicle drivers.

Phase 2 focused on the demographic of public utility vehicle (PUV) drivers wherein 30 jeepney and taxi drivers were purposely chosen from Parañaque City and interviewed in person patterned after the same DBQ. The motivation and the corresponding underlying reasons for exhibiting behavior in various traffic situations were first measured quantitatively, and through the explanations of drivers, their motivation were categorized whether automatic or reflective using the PRIME theory of motivation (please see Table 1). The researchers employed a psychologist to validate categories of the motivation which were then analyzed through descriptive statistics and test of proportions. Additional qualitative data were generated through a thematic analysis of the interview transcripts and cross-case synthesis. Data triangulation through a literature review and an interview with a subject matter expert on the PUV modernication program further deepened the findings. An overview of the method is illustrated in Figure 1.

Research Instrument

The Philippine DBQ adapted from this researcher's previous research (De Ocampo, Tanpoco, et al., 2022) was based on Gueho et al.'s (2014) instrument so chosen due to the inclusion of the traffic scenario related to positive behaviors. Below are brief descriptions of behaviors in different traffic scenarios or opportunities:

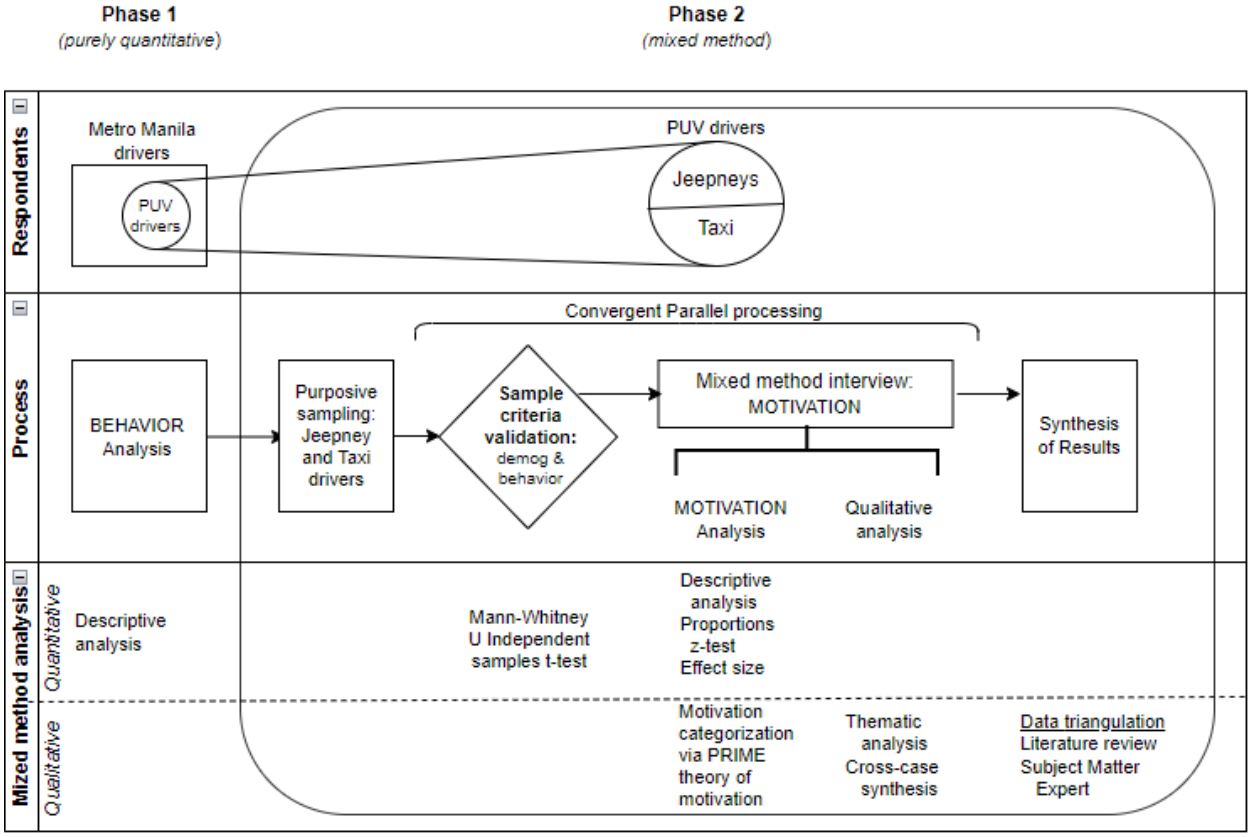
"Inattention errors" (InE) are unintentionally committed due to the individual's lack of mindfulness or attention. These are considered lapses, like misreading signs.

"Ordinary violations" (OV) are deliberate infractions of traffic rules and accepted driving norms but without aggression, like ignoring speed limits in highways or school zone areas or changing lanes abruptly.

"Dangerous errors" (DE) are unintentional acts but have a significant risk of causing harm to self and others, e.g., turning left at an intersection but misjudging the speed of an oncoming vehicle, which may not be able to stop to avoid collision.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

Figure 1: Illustration of the Explanatory Sequential Mixed Method as adapted from Creswell (2014)



5. RESULTS AND DISCUSSION

5.1 Phase 1 analysis

Conducting a descriptive analysis of the Phase 1 respondents, Metro Manila drivers, reveal an average age of about 43 years old and an average driving experience of about 18 years. Majority of the drivers are male, of high school level of education and driving daily. Almost ¾ of those surveyed are driving public utility vehicles. Please see tables 2 and 3.

Applying the COM-B model, the demographics of age, driving experience and driving frequency represents the "C" or the capability aspect which establishes that the PUV drivers may be considered to have expert skills being of mid-age, having about two decades of driving experience and driving regularly across the city streets. In this regard, the variables to be focused on in this study will just be "O" or the traffic opportunity or scenarios, "B" or the driver behavior self-rated using a Likert scale between 1 to 5, and "M" or the driver motivation for each behavior and traffic opportunity, whether automatic or reflective.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

Table 2: Phase 1 Demographic Analysis: Continuous variables

N = 423	Mean	Median	Standard deviation	Shapiro-Wilk W	Shapiro-Wilk p
Age	42.6	42	12.3	0.981	< .001
Driving Experience	17.6	17	11.1	0.961	< .001

Table 3.1: Phase 1 Demographic Analysis: Categorical variables

		Counts	% of Total	Cum%
N		**423**		
Gender	Female	14	3.3%	3.3%
	Male	409	96.7%	100.0%
Educational level	High school	228	53.9%	53.9%
	College	86	20.3%	74.2%
	Vocational	46	10.9%	85.1%
	Elementary	30	7.1%	92.2%
	Postgrad	22	5.2%	97.4%
	None	11	2.6%	100.0%
Driving Frequency	0-2x a week	84	19.9 %	19.9 %
	3-4x a week	87	20.6 %	40.4 %
	5-7x a week	252	59.6 %	100.0 %
Vehicle type	Public	322	76.1%	76.1%
	Private	101	23.9%	23.9%

The behavioral analysis of Metro Manila drivers regarding different traffic scenarios or opportunities are shown in Table 3. The numbers for the errors and violations show a low number meaning that the drivers, in their self assessment, rarely commit them while the positive behaviors are exercises frequently or sometimes only. It is an accepted fact that due to social desirability concerns, drivers tend to score themselves more towards the ideal situation (Paulhus, 1986).

Drivers' self-scoring is expected to be much lower for automatic processes like basic motor skills (e.g., changing gears, releasing handbrakes) and other perceptual processes (e.g., seeing signs or maintaining lanes) (Fuller, 2005) and as such, majority of the respondents rated themselves as "never" for inexperience errors (IxE) and "rarely" for committing inattention errors (InE), ordinary violations (OV) and dangerous errors (DE). This may be justifiable due to the demographics indicating expert driving skills and as such, respondents consider the processes in this traffic scenario as already "part of their system." For positive behaviors (PB), the respondents rated themselves highly with a mean behavior of "frequently."

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

This, however, does not invalidate driver behavior questionnaire results as researchers proceed to granular analysis of data. In this study, Phase 2 of the explanatory sequential mixed method, through qualitative interview allows researchers to probe more into the motivations of drivers of public utility vehicles, particularly, jeepneys and taxis.

Table 3.2: Phase 1 Behavior analysis according to traffic opportunity

	Behavior				
Traffic opportunity	**InE**	**OV**	**PB**	**DE**	**IxE**
N	423	423	423	423	423
Mean	1.70	1.58	3.58	1.52	1.72
Median	1.67	1.44	3.80	1.43	1.60
Standard deviation	0.43	0.47	0.90	0.51	0.63
Shapiro-Wilk W	0.968	0.891	0.955	0.882	0.905
Shapiro-Wilk p	< .001	< .001	< .001	< .001	< .001

Notes: 1. InE - Inattention Errors, OV – Ordinary Violations, PB – Positive Behaviors, DE – Dangerous Errors, IxE – Inexperience Errors
2. Likert scale measure: 1 (Never); 2 (Rarely); 3 (Sometimes); 4 (Frequently); 5 (Almost always true)

5.2 Phase 2 analysis

5.2.1 Sample criteria validation of Phase 2 samples

For Phase 2, the respondents were purposively taken from the Phase 1 pool. Selected are taxi and jeepney drivers estimating the distribution of a range of demographics emulating the Phase 1 respondents. To ensure that there is a good representation of the Phase 1 public utility vehicle (PUV) drivers, an independent samples Mann-Whitney U test is conducted given that the Phase 2 samples exhibited non-normality and a mix of homoscedastic data (Mishra et al., 2019). From the resulting p-values at a confidence level of 95% and effect sizes, there appears to be no significant difference in the age, experience in driving as well as behavior given the different traffic opportunities. This establishes that the PUV driver respondents purposely chosen are representative of the PUV driver-respondents in Phase 1.

Table 4: Sample criteria validation of PUV drivers' characteristics between Phase 1 and 2

		Independent Samples T-Test (Mann-Whitney U)				Normality test		Homoscedasticity test (Levene's)			
		Statistic	**p**	**Mean difference**	**Effect Size**	**W**	**p**	**F**	**df**	**df2**	**p**
Demog	**Age**	3556	0.090	-4.000	0.188	0.985	0.002	5.081	1	320	0.025
	Exp	2940	0.003	-6.000	0.329	0.968	< .001	0.384	1	320	0.536
Behavior	**InE**	3317	0.028	-0.218	0.243	0.963	< .001	1.182	1	320	0.278
	OV	3111	0.009	-0.221	0.290	0.885	< .001	0.001	1	320	0.982
	PB	1598	< .001	-0.800	0.635	0.972	< .001	15.710	1	320	< .001
	DE	3494	0.064	-0.143	0.202	0.879	< .001	2.050	1	320	0.153
	IxE	3023	0.005	0.200	0.310	0.918	< .001	5.838	1	320	0.016

Note. H_a: μ Phase1 ≠ μ Phase2

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

5.2.2 Motivation per traffic opportunity

The 40-item Philippine DBQ is divided into traffic scenarios or, in the COM-B model, corresponds to "O" or opportunities where errors and violations are committed and positive behaviors are exhibited. While it is an accepted fact that self-assessment questionnaires introduce some level of variance from reality as drivers tend to rate themselves higher towards the desirable responses due to factors like social desirability or the tendency towards positive self-descriptions (Paulhus, 1986), the qualitative aspect of the study allows the respondents to explain their motivations which are then discerned to fall into the sub-categories of the PRIME theory of motivations and then, later on, categorized to be either automatic or reflective.

It is in the underlying reasons or motivations that could explain the differentiations in the quantitatively measured behavior. For instance, in the interviews regarding slowing down on wet roads in order not to splash water on pedestrians and motorcycle riders, most drivers, if not all, answered: "Almost always true." Their reasoning was categorized as reflective motivation (either "inference" or "analysis"). At face value, it seems that everybody is simply courteous for this traffic opportunity of Positive Behavior. However, many drivers for both jeepneys and taxis answered that they do slow down when there are puddles of water to ensure that their brake pads do not get wet which is more of a safety consideration. They said that it would be dangerous for their vehicle as the braking power lessens. Then, seemingly as an afterthought, they continue their reasoning of being considerate to pedestrians, especially those on their way to work.

For the question on allowing other drivers to overtake, many respondents tended to answer "Almost always true" or "Frequently," but in their qualitative answers, most will not give way unless it is an emergency. As for ensuring that they are not obstacles to others and parking properly, most drivers highly rated themselves. However, in the MMDA 2014-2018 data, obstruction and illegal parking are among the top 10 violations (MMDA, 2019). Motivation for both these items was rated at about 70% reflectivity.

Particularly on PB of not being an obstacle to other drivers and road users, while jeepney and taxi drivers have an average self-assessed behavior of 3.6, as far as reflective motivation is concerned, jeepneys are at 53% reflectivity while taxis are at 73%. Please see Table 5. The apparent difference is in the type, number of passengers served, and destinations. Taxi drivers cater to individual or groups of passengers per trip, plying a wider area of Metro Manila roads. Therefore, they are more exposed to stricter traffic implementation in different cities, especially in the central business districts of Makati and Ortigas. In this regard, taxi drivers are firmer in asserting to passengers that they can only alight where it is safe and allowed. This is as opposed to jeepney drivers who take the same route many times during the day to get more passengers; they tend to be more accommodating to passengers wanting to alight wherever they want as long as there are no traffic enforcers in sight. They prefer more passengers getting on and off their vehicles along the route, which would mean higher incomes at the end of the day.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

Table 5: Comparison of Behavior and Motivation for the Traffic Opportunity of Positive Behavior

Question #	**Traffic scenario**	**Motivation**		**Behavior**	
		jeepney	*taxi*	*jeepney*	*taxi*
16	I make sure that I am not an obstacle for other drivers, (e.g., I don't stop by the roadside if other vehicles couldn't pass or I make sure that I don't stop at an intersection especially if there is a yellow box marking).	53%	73%	3.6	3.6
17	I adjust my speed in order to help a driver who is overtaking or transferring to my lane.	47%	47%	3.8	4.2
18	When driving on the inner or fast lane, I transfer lanes to allow cars behind me to pass.	87%	53%	4.5	4.9
19	I give consideration to other cars or pedestrians when parking my vehicle so that I don't obstruct or cause delays.	87%	93%	4.7	4.9
20	I slow down when there is water on the road to avoid splashing water to people on the sidewalk or open vehicles.	53%	60%	4.1	4.9
21	I avoid counterflowing in order to not disrupt traffic.	87%	87%	4.7	4.9
22	I avoid using high beams to avoid glare to other drivers.	100%	80%	4.1	4.5
23	I let pedestrians cross even if it is not a pedestrian crossing (e.g., there are roads where the pedestrian lane is very far or if there is a pedestrian overpass, senior citizens or PWD's cannot climb the stairs).	87%	67%	4.3	4.8
24	I don't tailgate or follow the next car closely so as not to disturb the driver.	60%	80%	3.5	4.2
28	I avoid honking my horn so as not to make noise.	73%	71%	4.1	4.5
	Average	73%	71%	4.1	4.5

Note: Likert scale measure of Behavior: 1 (Never); 2 (Rarely); 3 (Sometimes); 4 (Frequently); 5 (Almost always true)

A summary of the motivation of PUV drivers, whether reflective or automatic, can be seen in Table 6. In general, the reflective and automatic motivations in the PUV drivers in our study are 49% and 51%, respectively, indicating that drivers are reflective about half the time. Doing a test of proportions, a non-parametric test (Mishra et al., 2019) to test the hypothesis if there is a difference between reflective and automatic motivation per traffic opportunity, the p-values and effect sizes indicate that it is only for ordinary violations, dangerous errors, and positive behaviors that there is a significant difference. Particularly, for ordinary violations, drivers are reflective 57% of the time; for positive behaviors, they are reflective 73% of the time; and for dangerous errors, they are reflective 62% of the time.

In this regard, the hypothesis that PUV drivers are motivated automatically in their manifestation of driving behaviors is only partly supported, which means there is still the tendency to do tasks mindlessly depending on the driving scenarios.

To analyze the sub-categories under automatic and reflective motivations, it is to be noted that in the PRIME Theory of motivation, there are only three types of reflective motivations compared to 12 for automatic. As such, even if the numbers for the frequency of occurrences for the former may seem higher, the aggregation of all the automatic processes still came out to be higher than for the reflective ones. In this regard, the ranking of automatic motivations lists perception and habituation at the top, followed by associative learning, consistency disposition, and dissonance avoidance.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

Table 6: Summary Table and Proportion Test for Motivations of PUV drivers

		Traffic Opportunity					
		InE	**OV**	**PB**	**DE**	**IxE**	***Total***
Motivation	***Reflective***	***18.89%***	***57.41%***	***72.67%***	***61.9%***	***19.33%***	***48.58%***
	Inference	32	92	149	52	21	28.83%
	Analysis	19	62	54	78	8	18.42%
	Assimilation	0	1	15	0	0	1.33%
	Automatic	***81.11%***	***42.59%***	***27.33%***	***38.1%***	***80.67%***	***51.42%***
	Perception	107	32	3	39	17	16.50%
	Habituation	74	14	1	6	95	15.83%
	Associative learning	5	33	24	13	0	6.25%
	Consistency disposition	5	12	12	8	4	3.42%
	Dissonance avoidance	4	4	23	2	0	2.75%
	Sensitization	4	9	6	3	2	2.00%
	Imitation	13	7	1	4	1	2.17%
	Objectification	1	3	10	4	1	1.58%
	Identification	2	1	2	1	0	0.50%
	Maturation	4	0	0	0	1	0.42%
	Motivation						***100.00%***
Test of proportions	*z-value*	*-10.22*	*2.44*	*7.85*	*3.45*	*-7.51*	*-0.98*
	p-value	*1*	*.007*	*.000*	*.000*	*1*	*.837*
	Effect size	*Large, .67*	*Small, .15*	*Medium, .47*	*Small, .24*	*Large, .66*	*Small, .08*
	Remarks	*Not supported*	*Supported*	*Supported*	*Supported*	*Not supported*	*Not supported*

Notes: 1. IxE - Inexperience Errors, OV – Ordinary Violations, PB – Positive Behaviors, DE – Dangerous Errors, IxE – Inexperience Errors

2. The 48.58% reflective motivation is computed based on total frequencies of reflective motivation (PRIME categories 13-15) and not a mean of the listed values in the table per traffic scenario.

3. The test of proportions alternative hypothesis is that there is a difference between reflective and automatic motivation.

Perception is, according to the drivers, "pala-palagay lang," or doing actions based on gut feel, and therefore, it is an automatic motivation based on what first comes to mind. Habituation or "nakasanayan na" is an action done as a force of habit. Perception and habituation are related to almost mindless processes primarily associated with expert driving skills, which are characteristic of the PUV drivers who do the same mechanical processes of operating a vehicle day in and day out. In this regard, such automatic processes have already become part of instinct.

Associative learning is related to making the right decisions during traffic with the main motivation of avoiding an undesirable situation, e.g., getting violation tickets with hefty fines and associated inconveniences or having a traumatic experience like someone holding a gun to his head during a red light for not previously giving way. It is associative as the learning may have been from one's previous experiences or the experience of fellow drivers. From the interviews, many respondents have been cautious with traffic rules as traffic tickets are expensive.

Consistency disposition is another automatic motivation wherein drivers continue a behavior mindlessly just because it is what they have been doing in the past. This can be dangerous in the case of driving after having taken even just a bit of alcohol. On the other hand, this can also be a positive behavior, especially for jeepneys consistently staying in the slow lane on a highway and, thus, not being an obstacle for faster vehicles.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

Dissonance avoidance is doing actions to avoid disharmony or conflicts. So, this is related to drivers giving way to other vehicles not out of courtesy but to ensure that fellow drivers will not be angered. In the interview, one driver related why he got caught inside the yellow box in an intersection once. Despite the congestion beyond the traffic light, he felt he still had to cross the intersection due to the honking of the driver's horn behind, so he advanced even with the risk of getting caught in the middle of the intersection.

There were fewer responses related to sensitization, imitation, and objectification, but they may also provide good insights into automatic motivations. Sensitization is the drivers' knowledge of a traffic violation. However, drivers may ignore it due to having done it repeatedly in the past, e.g., swerving or quickly moving from the middle to the outer lane to pick up a passenger or, similarly, stopping a vehicle that may obstruct other road users while getting passengers. On the other hand, imitation is just copying what they see from other drivers, e.g., counterflowing or continuing even after the traffic light has turned red if others have been doing it. It may also be so for taxi drivers simply following passengers' instructions without much thought whether it will be against the rules or safety norms. Lastly, objectification is just making decisions based on likes and dislikes, e.g., not allowing vehicles to try to overtake if the driver seems to be showing off a flashy car or just being moody because it was a hot day.

Going deeper into the automatic motivations as discussed, when asked further, some drivers said that they were simply distracted and were lost in thought, and others said they were thinking of their problems. For most drivers who do not drive their own vehicle, their objective was just to get ahead of the traffic to get the most passengers to meet "boundary" requirements or the daily fixed rental cost to the vehicle owner. Before the pandemic, jeepney drivers claim that their average daily take-home pay was between P600-P1000 (US$12-$19)[1] while taxi drivers' take home a bit higher, between P1000-P2000 (US$19-$39) depending on the hours they could drive. Such amounts are a bit higher than the minimum daily wage at the time of the survey which was P570 or about $11 (Abad, 2023). However, during the pandemic, when even public utility vehicles were restricted, jeepney drivers' take-home pay dipped between P150-P300 (US$3-$6) while taxi drivers' was P200-P500 (US$4-$10). In this regard, driving a utility vehicle is a matter of survival.

5.3 Insights on traffic flow disruption according to PUV drivers

When asked for the causes of traffic, the majority of the PUV drivers attribute them not just to the number of vehicles on the road versus the amount and narrowness of roads but also to driver behavior, e.g., "drivers na naghihintay ng pasahero" (drivers who wait for passengers) and "kung saan saan nagbababa" (lets off passengers just anywhere).

As a corollary, the solutions to the traffic burden, according to the drivers themselves, are the combination of adding or widening the roads and controlling the number of vehicles on the road. However, more importantly, to counter erring driver behavior, the majority suggested a more effective traffic implementation, e.g., apprehensions for unregistered/misregistered vehicles and trucks operating during truck ban hours and managing of jeepneys proper loading and unloading.

5.4 Insights into the PUV Modernization Program

A separate section is written on the PUV Modernization Program (PUVMP) as it came out to be the greatest fear of mainly the jeepney drivers due to its impact on their livelihood, especially previously given a deadline of June 30 2023, then moved to December 31 2023 and the latest is April 30. The drivers have to be part of a consolidated entity or transport

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

cooperative, or else will not be allowed anymore to operate (Philippine News Agency, 2023; Romero, 2024; Viado, 2023).

The ultimatum, which includes the phase-out of jeepneys that are more than 15 years old, was most difficult for jeepney drivers-owners who were already self-sufficient and those who drive for small-scale operators. As the profile of PUV drivers is middle-aged, many respondents, especially those proceeding toward their senior years, could not afford to retire their old jeeps and invest in a modern one. Given their age, they also had no option of finding work elsewhere.

Reviewing the technical details of the PUVMP reveals that it is well-meaning. It was launched in 2017 by the Department of Transportation under the administration of former President Rodrigo Duterte intended to modernize the transport sector to address greenhouse gas emissions and especially for "drivers and operators [to] have stable, sufficient and dignified livelihoods" (*Briefing Paper for PUV Modernization Program*, 2017).

However, instead of instilling hope in PUV drivers, it has caused more distress in their hearts, and as such, transport strikes were organized yearly from 2017 to the present to halt the program. Transport groups see the program as anti-poor since modernization is being implemented on drivers and operators to benefit big automotive companies and foreign businessmen (Mantaring, 2023; Philippine News Agency, 2023).

A transport cooperative leader was interviewed to supplement information on the PUVMP. He is considered a subject matter expert for this study, given that he was able to go through the documentation-heavy transport cooperative application process for about 80 Euro 4-engine modern jeepney, and the cooperative has been approved for a bank loan and a franchise from the LRTFB[1]. As of this writing, he is in the process of working with the local government to get approval pending the required Local Public Transport Route Planning. The LGU[2] needed to ensure the volume of vehicles on the road to manage congestion, so their approval is required.

He believes the program is pro-poor as PUV drivers who will be cooperative members become part-owners and, therefore, are privileged to profit-share aside from the minimum wage and basic benefits they will receive as the drivers of modern vehicles. As per cooperative by-laws, each member is required to pay a membership fee. The amount was set to P40,001 for their cooperative or about US$812 (Personal communication, 2 October 2023).

However, there are still many aspects that still need to be ironed out. For instance,

- Viability of the 5-6-7 transport subsidy (5% government subsidy at 6% p.a. bank interest rate payable within 7 years) given that given an average cost of the modern jeepney at P2.8 million or about US$57,000 (Landbank, n.d.; Mantaring, 2023). As of January 24, 2024, 38 transport cooperatives defaulted on over P2 million PUV modernization loans (ANC 24/7, 2024).
- Sufficiency of funding or allocation in the national budget (Dela Cruz, 2022)
- Lack of coordination between the LTFRB, which grants the franchise, and the LGU, with the latter needing to give the final approval to operate based on their local design traffic plan
- Facilitation of drivers joining trusted transport cooperatives

[1] LTFRB or the Land Transportation Franchising and Regulatory Board is is in charge of the issuance of franchises for land transport operators. Source: https://dotr.gov.ph/road-sector/ltfrb.html

[2] LGU or Local Government Unit

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

The last item, consolidation with established transport cooperatives, is essential, as banks only give transport cooperatives or corporations loans. The cost of the cooperative membership fees and the documentary requirements of having to attend seminars and submit various requirements make it prohibitive for PUV drivers, given their demographic profile.

This underscores the importance of considering the human aspect of the driver situation as informed by the Industry 4.0 framework. Specifically, in Level 4 of the Industry 4.0 Integrated Traffic Management Framework proposed by De Ocampo, Clark and De Pedro (2022), it is essential to have a "whole of society" approach wherein all stakeholders are involved in the development of the solution as advocated by the Interagency report for second Global Sustainable Transport Conference (United Nations, 2021). In the case of the PUVMP, the program was conceptualized and implemented hurriedly, which caused more distress than help for the Philippine PUV drivers.

6. CONCLUSION AND RECOMMENDATION

The study shows that with the profile of PUV drivers showing expert level being of mid-age with experience of more than two decades driving frequently, they are partly reflective and partly automatic when they ply the Metro Manila streets. The majority of the apparent seemingly mindless behaviors could be attributed to perception or decisions based on gut feeling and habituation or actions based on repetitive actions. This contributes to driver behavior-based congestion, such as improper loading and unloading of passengers or not giving way to other vehicles. At face value, it may appear that PUV drivers do not practice basic driving courtesy, but in the traffic scenario of exhibiting positive behaviors, they show a more reflective behavior, ensuring the safety of pedestrians. While it is true that the drivers themselves point to improper driver behavior as one of the top causes of traffic in the city, aside from the too many vehicles on the road or not enough roads, digging deeper, their behavior on the road is guided by their objective to finish their daily shift with a higher take-home pay. In this regard, driver behavior-based city congestion needs to, first and foremost, address the main concern of PUV drivers—their livelihood—especially in the face of socio-economic stresses like the pandemic and the continually increasing inflation rates and rising oil prices.

Thus, it is recommended that the Industry 4.0 Integrated Traffic Management Framework be used for a thorough study before the launch of traffic-related programs like the PUVMP (De Ocampo et al., 2022a). The implementation and management sit at the highest level, Level 5—sustainable traffic management. However, the PUVMP rollout was distressing to PUV drivers as they perceived it as threatening their livelihoods. The modernization program seems to have been swiftly implemented, but the intended direct beneficiaries, the drivers themselves, felt left out.

Level 4 of the framework is integrated planning and coordination, emphasizing multi-stakeholder engagement. PUV drivers are the direct stakeholders and must be included in the planning phase despite their education level. As the drivers' livelihood is concerned, the human aspect must be addressed appropriately to ensure their willful cooperation rather than just being forced into complying with government programs.

Therefore, the program needs further study, and it is the recommendation of the researchers that to ensure the objectivity and holistic consideration of all factors, objective or neutral parties should be involved in the revisiting of the PUVMP, especially those who will not benefit financially from the program, e.g., consultants from the academe, other transport experts.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

On the aspect of encouraging drivers in general, not just PUV drivers, to be reflective and courteous drivers as a means to mitigate driver behavior-based congestion, it is recommended to launch driver education campaigns to make driving courtesy part of the consciousness of drivers. A good model is the nationwide education campaign on the COVID-19 vaccination, such that advertisements were widespread and frequent. Still, in line with the Industry 4.0 Integrated Traffic Management Framework, multi-stakeholder integrated planning and coordination are recommended to develop creative and sustainable solutions, particularly the engagement of the private sector, which could be tapped for funding as part of corporate social responsibility (CSR).

There are many aspects of solving traffic congestion, but the human aspect must be included in formulating strategies that align with the Industry 4.0 paradigm. While various solutions must be interlaced together to come up with a sustainable solution, one must remember the huge role of the driver himself or herself in making the general driving experience as less stressful as possible. Inculcated deep in the consciousness of all drivers must be the value that they are NOT just one person anyway or an exception, and therefore, their behavior will not make a dent in the traffic situation. They must realize and therefore have the conviction that they are one of the significant many who can make a difference in making driving a pleasant experience for everyone and contribute much in one's little way, ultimately to the economy and the environment.

ACKNOWLEDGMENT

The authors would like to express their sincere appreciation to the anonymous reviewers for their helpful comments and suggestions.

REFERENCES

[1] Alexander, K. E., Brijnath, B., & Mazza, D. (2014). Barriers and enablers to delivery of the Healthy Kids Check: An analysis informed by the Theoretical Domains Framework and COM-B model. *Implementation Science*, *9*(1), 60. https://doi.org/10.1186/1748-5908-9-60

[2] ANC 24/7. (2024). *PH lawmaker : 38 transport coops , corporations unable to pay over P2-B PUV modernization loans*. Youtube.Com. https://youtu.be/ymd7RDPKLDo

[3] *Briefing paper for PUV modernization program*. (2017).

[4] Bucchi, A., Sangiorgi, C., & Vignali, V. (2012). Traffic Psychology and Driver Behavior. *Procedia - Social and Behavioral Sciences*, *53*, 972–979. https://doi.org/10.1016/j.sbspro.2012.09.946

[5] Chan, A., Suryadipura, D., & Kostini, N. (2021). City Image: City Branding and City Identity Strategies. *Review of Integrative Business and Economics Research*, *10*(1), 330–341.

[6] Courtenay, M., Rowbotham, S., Lim, R., Peters, S., Yates, K., & Chater, A. (2019). Examining influences on antibiotic prescribing by nurse and pharmacist prescribers: A qualitative study using the Theoretical Domains Framework and COM-B. *BMJ Open*, *9*(6), e029177. https://doi.org/10.1136/bmjopen-2019-029177

[7] Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). Sage.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

[8] Cristiani, E., Fabritiis, C. De, & Piccoli, B. (2010). A Fluid Dynamic Approach for Traffic Forecast from Mobile Sensor Data. *Communications in Applied and Industrial Mathematics*, *1*(1), 54–71. https://doi.org/10.1685/2010CAIM487

[9] De Ocampo, B. M., Clark, E., & De Pedro, M. (2022). An Industry 4.0 framework towards an Integrated Smart Traffic Management Solution. *Philippine Academy of Management E-Journal*, *5*(2), 8–22.

[10] De Ocampo, B. M., Tanpoco, M., & Llave, C. (2022). Understanding behavior-based city congestion: The importance of education towards inter-driver cooperation. *Baltic Journal of Law & Politics*, *15*(1), 957–982. https://versita.com/menuscript/index.php/Versita/article/download/404/526

[11] De Souza, F., Verbas, O., & Auld, J. (2019). Mesoscopic traffic flow model for agent-based simulation. *Procedia Computer Science*, *151*, 858–863. https://doi.org/10.1016/j.procs.2019.04.118

[12] De Winter, J. C. F., Dodou, D., & Stanton, N. A. (2015). A quarter of a century of the DBQ: some supplementary notes on its validity with regard to accidents. In *Ergonomics* (Vol. 58, Issue 10, pp. 1745–1769). Taylor and Francis Ltd. https://doi.org/10.1080/00140139.2015.1030460

[13] Dela Cruz, R. C. (2022, September 28). DOTr continues to lobby for PUV modernization budget in 2023. *Philippine New*. https://www.pna.gov.ph/articles/1184888

[14] Fuller, R. (2005). Towards a general theory of driver behaviour. *Accident Analysis and Prevention*, *37*(3), 461–472. https://doi.org/10.1016/j.aap.2004.11.003

[15] Gatarin, G. R. (2023). Beating the traffic: Civil society participation in transport reforms and innovations in Metro Manila, Philippines. In L. T. T. (eds) Mookherjee, D., Pomeroy, G.M., Huong (Ed.), *Advances in 21st Century Human Settlements* (pp. 143–158). Springer. https://doi.org/https://doi.org/10.1007/978-981-19-8726-7_9

[16] Greenberg, H. (1959). An Analysis of Traffic Flow. *Operations Research*, *7*(1), 79–85.

[17] Guého, L., Granié, M. A., & Abric, J. C. (2014). French validation of a new version of the Driver Behavior Questionnaire (DBQ) for drivers of all ages and level of experiences. *Accident Analysis and Prevention*. https://doi.org/10.1016/j.aap.2013.10.024

[18] Huang, G., Luster, M., Karagol, I., Park, J. W., & Pitts, B. J. (2020). Self-perception of driving abilities in older age: A systematic review. *Transportation Research Part F: Traffic Psychology and Behaviour*, *74*, 307–321. https://doi.org/10.1016/j.trf.2020.08.020

[19] Jamshidnejad, A., Papamichail, I., Papageorgiou, M., & De Schutter, B. (2017). A mesoscopic integrated urban traffic flow-emission model. *Transportation Research Part C: Emerging Technologies*, *75*, 45–83. https://doi.org/10.1016/j.trc.2016.11.024

[20] *JICA to help Philippines ease traffic congestion in Metro Manila*. (2018). Japan International Cooperation Agency. https://www.jica.go.jp/philippine/english/office/topics/news/180920.html

[21] Kok, G., Gottlieb, N. H., Peters, G. J. Y., Mullen, P. D., Parcel, G. S., Ruiter, R. A. C., Fernández, M. E., Markham, C., & Bartholomew, L. K. (2016). A taxonomy of behaviour change methods: an Intervention Mapping approach. *Health Psychology*

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

Review, *10*(3), 297–312. https://doi.org/10.1080/17437199.2015.1077155
[22] Landbank. (n.d.). *Speed PUV Loan Program*. Retrieved February 18, 2022, from https://www.landbank.com/loans/business-loans/generalsmall-medium-enterprises/speed-puv-loan-program
[23] Mantaring, J. R. (2023, March 5). TIMELINE : The government's PUV phaseout program. *CNN Philippines*. https://www.cnnphilippines.com/transportation/2023/3/5/timeline-the-governments-puv-phaseout-program.html
[24] Martinussen, L. M., Møller, M., & Prato, C. G. (2017). Accuracy of young male drivers' self-assessments of driving skill. *Transportation Research Part F: Traffic Psychology and Behaviour*, *46*, 228–235. https://doi.org/10.1016/j.trf.2017.03.001
[25] Metropolitan Manila Development Authority. (2019). *MMDA Top-10-Most-Common-Traffic-Violations*. https://mmda.gov.ph/images/Home/FOI/Top-10-Most-Common-Traffic-Violations.pdf
[26] Michie, S., & West, R. (2013). Behaviour change theory and evidence: A presentation to Government. *Health Psychology Review*, *7*(1), 1–22. https://doi.org/10.1080/17437199.2011.649445
[27] Mishra, P., Pandey, C., Singh, U., Keshri, A., & Sabaretnam, M. (2019). Selection of appropriate statistical methods for data analysis. *Annals of Cardiac Anaesthesia*, *22*(3), 297–301. https://doi.org/10.4103/aca.ACA_248_18
[28] Muhwava, L. S., Murphy, K., Zarowsky, C., & Levitt, N. (2019). Experiences of lifestyle change among women with gestational diabetes mellitus (GDM): A behavioural diagnosis using the COM-B model in a low-income setting. *PLOS ONE*, *14*(11), e0225431. https://doi.org/10.1371/journal.pone.0225431
[29] Paulhus, D. L. (1986). Self-Deception and Impression Management in Test Responses. *Personality Assessment via Questionnaires*. https://doi.org/10.1007/978-3-642-70751-3_8
[30] Philippine News Agency. (2023, October 14). *7 transport groups not joining Manibela-led strike on Monday*. https://www.pna.gov.ph/articles/1211812
[31] Philippine Statistics Authority. (2023, June 15). *Tourism contributes 6.2 percent to GDP in 2022*. https://psa.gov.ph/statistics/tourism/node/1684059873
[32] Rahadi, R. A., Ghassani, G. G., Rudito, P., Sunitiyoso, Y., Bisma, J., Badan, O., Borobudur, I., Dwi, R., Sekolah, T. I., Ekonomi, E., & Bandung, I. (2021). Development of Borobudur Integrated Ecosystem to Improve Tourist Motivation Visit. *Review of Integrative Business and Economics Research*, *10*(1), 189–216. http://sibresearch.org/uploads/3/4/0/9/34097180/riber_10-s1_19_u20-053_189-217.pdf
[33] Reason, J., Manstead, A., Stephen, S., Baxter, J., & Campbell, K. (1990). Errors and violations on the roads: A real distinction? *Ergonomics*, *33*(10/11), 1315–1332. https://doi.org/10.1080/00140139008925335
[34] Romero, A. (2024, January 25). Marcos Jr. extends PUVMP deadline by 3 months. *PhilStar Global*. https://www.philstar.com/headlines/2024/01/25/2328404/marcos-jr-extends-puvmp-deadline-3-months
[35] United Nations. (2021). Sustainable transport, sustainable development. *Interagency Report for Second Global Sustainable Transport Conference*.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)

https://sdgs.un.org/sites/default/files/2021-10/Transportation Report 2021_FullReport_Digital.pdf

[36] Viado, M. V. (2023, March 6). What you need to know about the proposedjeepney modernization. *Philippine Information Agency*. https://pia.gov.ph/news/2023/03/06/what-you-need-to-know-about-the-proposed-jeepney-modernization

[37] Yu, L. S. (2024, January 19). Metro Manila has world's worst metro area traffic in 2023. What can we learn? *Rappler*. https://www.rappler.com/business/manila-world-worst-metro-area-traffic-2023/#:~:text=Out of 387 cities across,10 kilometers in Metro Manila.

ISSN: 2304-1013 (Online); 2304-1269 (CDROM); 2414-6722 (Print)