

# **CONFIRMATORY FACTOR ANALYSIS OF THE POSITIVE BEHAVIORAL IMPACT OF LOGISTICS PERSONNEL: A CASE STUDY OF PUBLIC TRANSPORT DRIVERS IN BANGKOK, THAILAND.**

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## **Abstract**

Confirmatory Factor Analysis of positive behavioral impact of logistics personnel: a case study of public transport in Bangkok, Thailand aimed to analyze and examine the confirmatory factors of logistics personnel with empirical data according to the hypotheses. The samples of this research were 357 public transport drivers. The data were collected through a questionnaire and analyzed by Confirmatory Factor Analysis (CFA) with Analysis of Moment Structure (AMOS). The research findings of positive behavioral impact of logistics personnel: a case study of public transport in Bangkok, Thailand showed that the measurement model of perception, condition, and internal rules were consistent with positive behavior: Chi-square=356.6790, DF=349, p=.3769, CMIN/DF=1.0220, AGFI=.9632, GFI=.9684, RMSEA=.0054, RMR=.0183

**Keywords:** Public Transport, Public Transport Driver, Logistics Activity, Positive Behavioral

## **1. INTRODUCTION**

To drive business success, the employee behavior at all levels related to business activities is an important factor, especially in businesses that deal with logistics activities involving the entire supply chain, both directly and indirectly in many related industries, such as drivers, warehouse workers, corporate customer service staff, and personnel providing various logistics services. Utilizing employee behavioral data can improve business design activities. There is a number of studies on behavioral data for service design in various perspectives which is the implementation of strategy to drive logistics activities through employees. This is considered the top priority in driving business activities to build business credibility and competitiveness as many companies rely on the transportation of goods for their daily business operations. Logistics activities should include important factors that can develop all personnel and bridge the gap between locations, which will be the catalyst for job creation worldwide. The industry has been growing tremendously in recent times, but to ensure that these growths remain efficient, businesses in the logistics arena need to hire employees with the right skills, which is

mandatory. Joanne E. et al. (2021) addressed that driving anxiety was a common experience that can have a profound impact on everyday performance, especially avoidance of driving and car trips. Therefore, appropriate psychological treatment guidelines must be designed, not only the behavior of the driver. Steve O'Hern et al. (2020) addressed that the classification of driver behavior should be made, as abnormal pedestrian behavior affects traffic users. Ling Luo and Jing Shi (2020) stated that the root cause of these and other behaviors was also essential to driver attitudes and behaviors that required good concentration while working to reduce negligent behavior. Although road traffic accidents and fatalities were a worldwide problem, the rates of road accidents and fatalities showed a different relationship. Similarly, driver behavior, traffic conditions, and their relationships also showed different relationships. (Yesim Üzümcüoğlu et al., 2020)

The correlation between abnormal driving behaviors of public transport drivers and three influencing factors studied were weather, safety, and stress and inattention. In terms of expected benefits from traffic safety, Huey-Kuo Chen et al. (2019) stated that realizing the potential benefits and eliminating the negative effects of amending upon the national economy and alleviating inconveniences that occurred in people's daily lives required follow-up studies to add value to the well-being of a society whether it was safe and convenient in public transport, and according to Özlem Ersan et al. (2019) that the moderating role of other people's driving on the relationship between abnormally aggressive driving behavior and positive behavior was examined.

The researcher, therefore, was interested in developing and validating the confirmatory factor analysis of the positive behavioral impact of logistics personnel in the case of public transport drivers in Bangkok, Thailand.

## **2. RESEARCH OBJECTIVE**

To analyze and examine the Confirmatory Factor Analysis (CFA) of the impact of the positive behavior of logistics personnel in the case of public transport drivers Bangkok, Thailand.

## **3. HYPOTHESIS**

The research hypotheses of the Confirmatory Factor Analysis (CFA) model of the positive behavioral impact of logistics personnel in the case of public transport drivers Bangkok, Thailand were developed in accordance with the empirical data.

## **4. LITERATURE REVIEW**

The researcher synthesized research key points from various researchers who have studied the three key elements that could be used to screen for the positive behavior of public transport drivers. The research was based on the following issues: 1) Knowledge

about Perception that the following academics had studied: J Chen Wang and others (2018), Sergio A. and others (2019) and Sergio A. and others (2018); 2) Knowledge about Condition that following academics had studied: Wenhui Chu and others (2019) and Darren Wishart and others (2017) and 3) Knowledge of Internal Rules that the following academics had studied: Yesim Üzümcüoğlu and others (2021 ) and Sergio A. and others (2019)

## **5. RESEARCH METHODS**

### **5.1 Population and sample**

The population used in this research was 5,572 mass transit drivers in Bangkok, Thailand. (Bangkok Mass Transit Authority, 2020)

#### **5.1.1 Sample group**

A sample of was selected for the study based on the Krejcie and Morgan (1970) sample size determination table. The sample size representative of the public transport drivers in Bangkok in this example is 357

### **5.2 Research tools**

The researcher created a questionnaire as a tool for collecting data. The study was conducted based on fundamental data, theories and literature reviews, as well as research related to factors affecting positive driver behavior.

**Part 1** The general information of the respondents were to be marked in the checklist.

**Part 2** A closed-ended questions about the actual level of behavior of public transport drivers in Bangkok, Thailand included Perception, Condition, Internal Rules, and Positive Behavior of drivers.

Each question has 6 scales for respondents to check the frequency of their behaviors as follows:

5 means Nearly All the Time

4 means Frequently

3 means Quite Often

2 means occasionally

1 means Hardly Ever

0 means Never

## List of abbreviations

Abbreviations	Definition
PER1	You have been <b>“trained”</b> on work safety.
PER2	You know how to <b>“use safety equipment”</b> during work.
PER3	You know how to maintain <b>“bus quality”</b> and know what needs to be checked.
PER4	You know about enforcement measures about <b>“Road Traffic Law”</b> .
PER5	You know the standards of practice for <b>“Passenger Service”</b>
PER6	You know the legal requirements regarding <b>“Use of vehicle”</b> for public transportation
PER7	You know about <b>“First Aid Procedures”</b> for yourself and others when an accident occurs.
PER8	You know the <b>“scope of responsibility”</b> in the event of any unusual event or accident during work.
PER9	You know how the quality of your performance will affect <b>“the quality of life for citizens”</b> .
PER10	You know the correct method for <b>“moving passengers”</b> in the event of an accident.
PER11	You know about <b>“your driving behavior”</b> ,
PER12	You are aware of <b>“pedestrian behavior”</b> .
PER13	You are aware of <b>“other vehicles’ users behavior”</b> .
CON1	You are <b>“comfortable with work schedule change”</b> .
CON2	Your <b>“uniform”</b> is appropriate for work.
CON3	You can make good <b>“use of facilities”</b> on the bus.
CON4	<b>“Road Conditions and Infrastructure”</b> supports your work.
CON5	You preliminarily <b>“check bus performance”</b> before operating.
CON6	You are <b>“willing to notify the repair”</b> of the bus
CON7	The <b>“bus driver seat”</b> is suitable for your operation.
CON8	<b>“Noise”</b> affects your performance
CON9	<b>“Pedestrian conditions at the pick-up point”</b> affect your operations.
CON10	Ease of use of <b>“Bathrooms and dining areas”</b> facilitate your operations.
CON11	You have used the provided <b>“rest area”</b> during performing duties and after completion of the duties.
CON12	You encounter the <b>“nuisance behavior”</b> of passengers.
CON13	You encounter a <b>“homeless person or beggar”</b> in the bus while you were performing duties.
CON14	<b>“Other road users’ behavior”</b> affects your performance.
CON15	You have encountered an <b>“incident where another vehicle enters a lane”</b> for public transport.
CON16	You are <b>“fined”</b> by the police.
CON17	During your work, you receive <b>“facilitation and assistance”</b> from the traffic police.
CON18	You experience heavy <b>“traffic conditions”</b> while performing duties.

Abbreviations	Definition
CON19	During work, you must use <b>“dangerous road conditions”</b>
CON20	You must work in <b>“the weather that reduces the quality of your work”</b> .
CON21	<b>“Billboards”</b> on traffic areas affects driving visibility during your work.
INT1	<b>“Supervisors consult employees”</b> every time when making a decision that affects their daily work life.
INT2	You have <b>“opportunities to give opinions”</b> on matters affecting your workspace.
INT3	The expression of <b>“your opinion”</b> is accepted by the supervisor.
INT4	You encounter <b>“job rotation and changes”</b> often
INT5	There is an <b>“equality”</b> regarding the transfer policy of bus drivers.
INT6	It is clear and fair regarding <b>“taking leave”</b> .
INT7	<b>“Complaint”</b> handling is your priority.
LAP1	<b>“Read the sign”</b> when exiting roundabout wrongly causing you to drive into the wrong road.
LAP2	Attempt to <b>“exit the traffic light”</b> in third gear.
LAP3	Realize that you are <b>“driving to the wrong place”</b> because it is a familiar or similar place.
LAP4	<b>“Press the wrong button”</b> but you actually want to press another button.
LAP5	<b>“Put in the wrong gear”</b> or into third gear when you want to drive after stopping at a red light.
LAP6	Drive for a while and then realize that you're <b>“driving to another place where you do not want to go.”</b>
LAP7	Crash into something <b>“invisible”</b> while driving in reverse.
LAP8	<b>“Forget what gear the car is in”</b> then you have to look back to check.
LAP9	<b>“Turn into the wrong lane”</b> when turning at an intersection
LAP10	Could not <b>“Remember the route you just drove past”</b> clearly.
LAP11	<b>“Get distracted”</b> while driving and suddenly sees the car in front slow down then you have to brake because you are afraid of crashing.
LAP12	<b>“Can't notice people crossing the road”</b> when turning from the main road onto another street or alley.
LAP13	I can't see people walking across the street while driving on the straight roads.
LAP14	<b>“Forget where the car is parked”</b> in a wide parking lot and/or where the cars are similar.
ERR1	Attempt to <b>“overtake a car with a left turn signal”</b>
ERR2	Suddenly brake or turn the steering wheel <b>“until the car slipped”</b> .
ERR3	Wrongly estimate the green light timing then you are <b>“unable to stop”</b> safely.

Abbreviations	Definition
ERR4	<b>“Underestimating the speed of another vehicle”</b> when you want to overtake or turn left.
ERR5	<b>“Cannot notice”</b> that the car in front intends to turn left when you want to overtake.
ERR6	<b>“Almost hit the car in front”</b> while driving on a straight road.
ERR7	<b>“Suddenly brake”</b> on wet roads or on roads in poor condition.
ERR8	Watch the car on the other side while waiting to turn left on the main road and <b>“almost hit the car in front of you.”</b>
ERR9	<b>“Suddenly brake”</b> because you are unable to notice that the car in front is braking.
ERR10	<b>“Forget to turn on the signal light”</b> while turning.
ERR11	While waiting to turn left onto the main road, you pay too much attention to main road traffic and <b>“almost hit the car in front”</b>
ERR12	Hurry to drive through the yellow light because you are <b>“afraid to be stuck at a red light”</b>
ERR13	<b>“Lose concentration”</b> until leaving the distance with the car in front improperly and almost crash.
ERR14	<b>“Not limit speed while driving”</b> in the late night or in the early morning due to the smooth traffic flow and no congestion.
ERR15	Think about something else while driving and <b>“forget that the high beams are on”</b> , and you realized when other cars flash high beams.
ERR16	Think about other things/lose concentration until you <b>“can't see people waiting to cross the road”</b> when the traffic lights turn red.
ERR17	<b>“Cannot see”</b> people stepping from the back of the bus or from a parked car and almost crash him/her.
ERR18	As you wait to turn onto the main road, you <b>“pay too much attention to the traffic on the main road”</b> until you almost hit the car in front.
ERR19	<b>“Almost hit a cyclist”</b> while turning right or left
ERR20	<b>“Overtake a slow car while the road is reduced to a single lane”</b> to check if it is one lane or have road repairs.
ERR21	<b>“Forget to release the handbrake”</b> before the car is about to start.
ORD1	Lose concentration when <b>“drinking water”</b> while driving
ORD2	Lose concentration when <b>“using a mobile phone”</b> while driving
ORD3	Lose concentration when <b>“typing text”</b> while driving
ORD4	Lose concentration while <b>“talking to passengers”</b> while driving
ORD5	Use your social status or personal relationship with someone as an excuse. <b>“to avoid fines or penalties”</b>
ORD6	<b>“Forget to put on the handbrake”</b> while parking.
ORD7	<b>“Rushing through the intersection”</b> despite knowing that the traffic light is changed to a yellow light or a red light.
ORD8	<b>“Not care about speed limits”</b> on residential roads

Abbreviations	Definition
ORD9	" <b>Drive faster than the speed limit</b> " that limits the speed in school areas.
ORD10	Drive away from the intersection until " <b>other drivers who have the right of way need to stop.</b> "
ORD11	" <b>Stay in the lane you know will be closed</b> " until the last minute and then drive into another lane.
ORD12	" <b>Hurry to drive away after the signal light</b> " changed from red to green, intending to compete with another car nearby.
ORD13	" <b>Not care about speed limits</b> " on expressways or rural roads.
ORD14	" <b>Hurry to drive away from the oncoming vehicle</b> " on roads that are obstructed or have a one-car gap.
ORD15	" <b>Lose patience</b> " with slow drivers and try to overtake on the left.
ORD16	Race with other cars " <b>without appointment</b> ".
ORD17	Park on the " <b>double solid yellow line which is likely to get fined</b> ".
ORD18	" <b>Hit the horn to let the other car know</b> " that you are offended.
ORD19	" <b>Chasing another car</b> " because you want to show your anger.
ORD20	" <b>Shouting insults at other drivers</b> " to express anger and frustration.
ORD21	Continue driving at the same speed " <b>even if you suspect that you have exceeded the speed limit</b> "
AGG1	" <b>Ignore</b> " the give way signs and narrowly avoid crash.
AGG2	" <b>Not look in the rearview mirror</b> " when changing lanes or driving onto a main road.
AGG3	Follow the car in front at a very close distance " <b>so it is hard to brake in time in an emergency</b> "
AGG4	Drive from the main road to the secondary road, " <b>without caring that there is someone crossing the road, bicycle or other vehicles</b> ".
AGG5	Drive fast " <b>when in a bad mood</b> "
AGG6	" <b>Can't see the give way sign</b> " until almost hit the car in the right of way.
AGG7	Try to overtake the car in front without looking in the mirror first, so " <b>you are honked by another car that is trying to overtake</b> ".
AGG8	Attempt to overtake the vehicle in front without " <b>noticing that the vehicle in front is giving a turn signal</b> ", left or right.
AGG9	" <b>Turn at the intersection too far until driving into the wrong way</b> " and you have to find the right entrance again.
AGG10	Sudden lane change " <b>at the last second</b> "
AGG11	" <b>Drive slowly intentionally</b> " to annoy the drivers behind.
AGG12	" <b>Use high beams to disturb</b> " the oncoming vehicle.
POS1	" <b>Be courteous and careful</b> " not to let water splash on



Abbreviations	Definition
	pedestrians while driving.
POS2	" <b>Not drive out of the lane or drive too slowly</b> " until it blocks the car behind
POS3	Try " <b>not to honk the horn so as not to annoy</b> " others.
POS4	" <b>Be careful</b> " not to let other drivers affected when you drive on the left.
POS5	" <b>Keep a safe distance</b> " while driving.
POS6	" <b>Give way to pedestrians,</b> " even if you have the right to go first.
POS7	" <b>Keep the distance</b> " as necessary to avoid disturbing the driver in front.
POS8	" <b>Avoid using the far right lane</b> " so that the fast vehicles can go faster and the traffic will not be stuck.
POS9	" <b>Reduce speed</b> " for other drivers to overtake.
POS10	" <b>Be careful</b> " not to park your car interfering with other vehicles and road users

### 5.3 Analysis of Results

In this research, the analysis was divided into two steps.

5.3.1 Analysis of the actual frequency of the positive behavior of logistics personnel in the case of public transport drivers Bangkok, Thailand. The statistics used were descriptive statistics, i.e. frequency, percentage, mean and standard deviation.

5.3.2 Confirmatory Factor Analysis CFA was used to examine the positive behavioral impact of logistics personnel in the case of public transport drivers Bangkok, Thailand based on assumptions and empirical data, with Analysis of Moment Structure (Amos) Program.

## 6. RESEARCH RESULTS

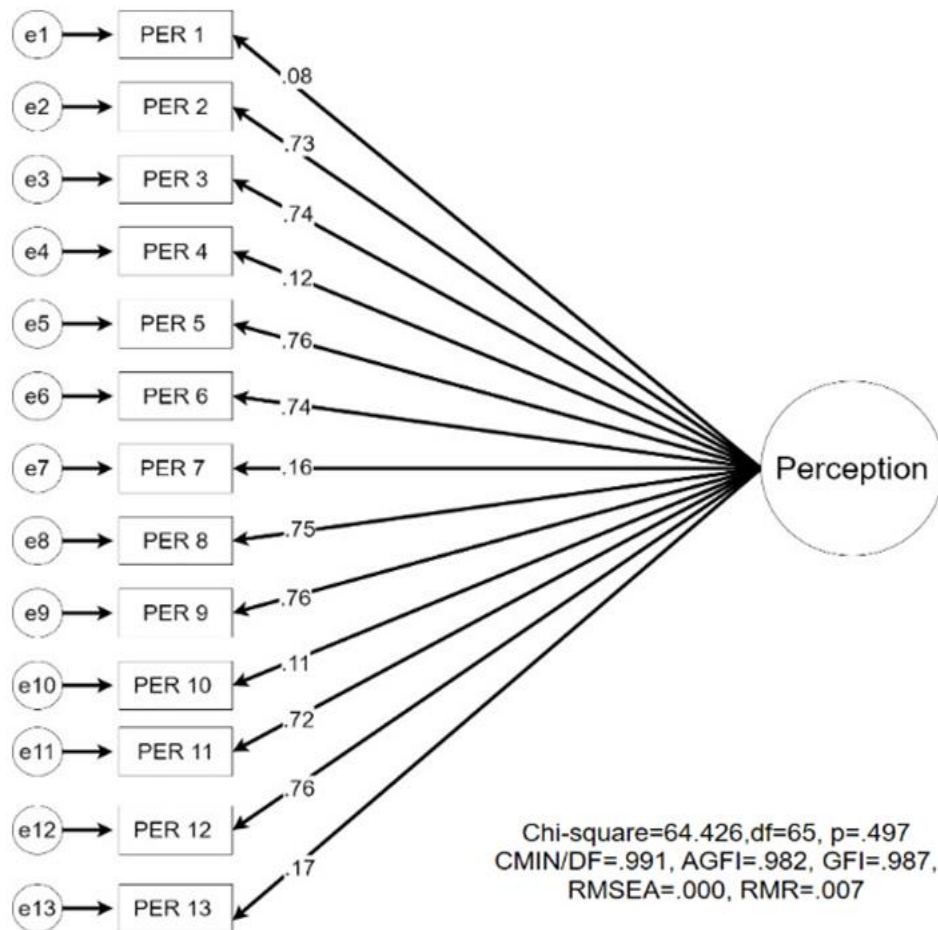
The Confirmatory Factor Analysis (CFA) of the positive behavioral impact of logistics personnel in the case of public bus driver Bangkok, Thailand was illustrated as follows:

### 6.1 The Confirmatory Factor Analysis (CFA) of each perspective.

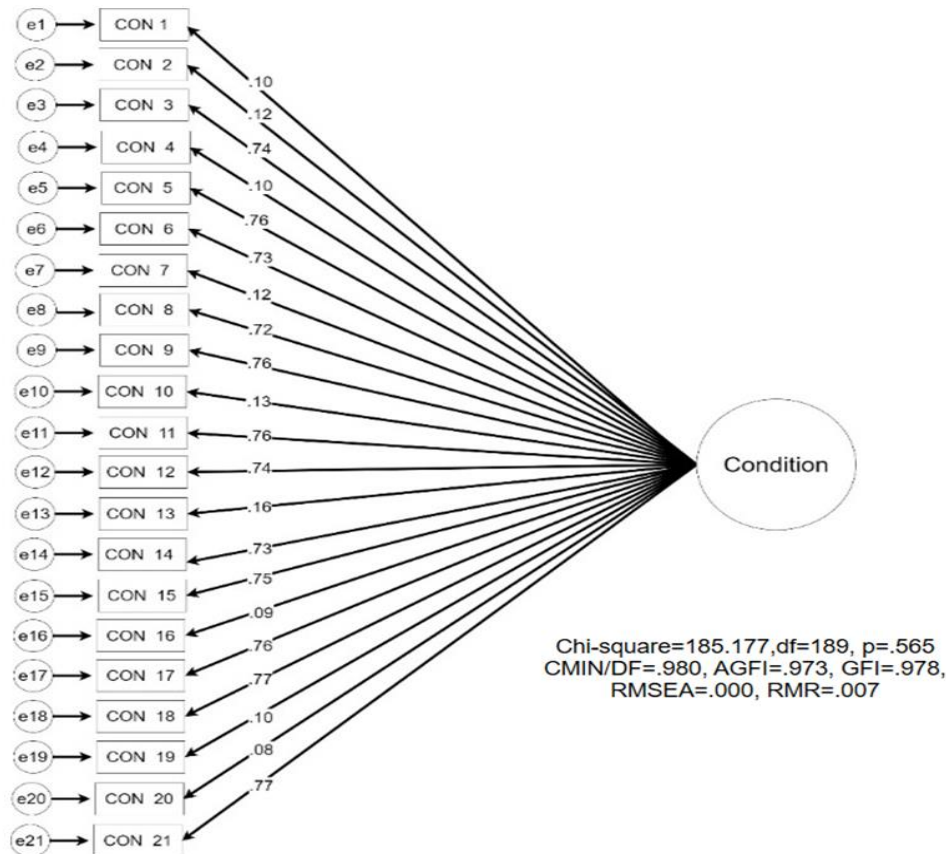
The Confirmatory Factor Analysis (CFA) of Perception (PER) that affected the positive behavior of logistics personnel in the case of public transport drivers Bangkok, Thailand revealed that the empirical data passed the criteria according to the ideas of Hair et al. (2006) and Bollen (1989), indicating that the model was consistent with the empirical data, Chi-square=64.426, df=65, p=.497, CMIN/DF=.991, AGFI=.982, GFI=.987, RMSEA=.000, RMR=.007, but there was a proposal to cut off factor loadings below 0.5, five issues were PER1, PER4, PER7, PER10 and PER13.



Figure 1: Confirmatory Factor Analysis of Perception

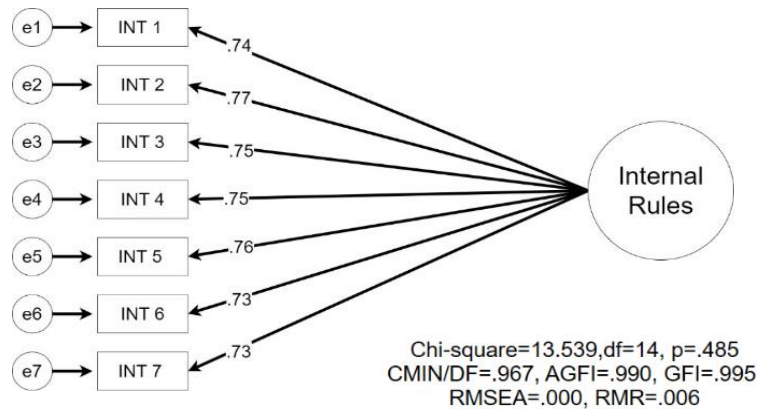


**Figure 2: Confirmatory Factor Analysis of Condition**



The Confirmatory Factor Analysis CFA of Condition (CON) on Work Environment and Traffic Environment Conditions that affected the positive behavior of logistics personnel in the case of public transport drivers in Bangkok, Thailand revealed that the empirical data passed the criteria according to the ideas of Hair et al. (2006) and Bollen (1989), indicating that the model was consistent with the empirical data. Chi-square=185.177, df=189, p=.565, CMIN/DF=.980, AGFI=.973, GFI=.978, RMSEA=.000, RMR=.007, but there was a proposal to cut off factor loading below 0.5, nine issues were CON1, CON2, CON4, CON7, CON10, CON13, CON16, CON19 and CON20.

**Figure 3: Confirmatory Factor Analysis of Internal Rules**

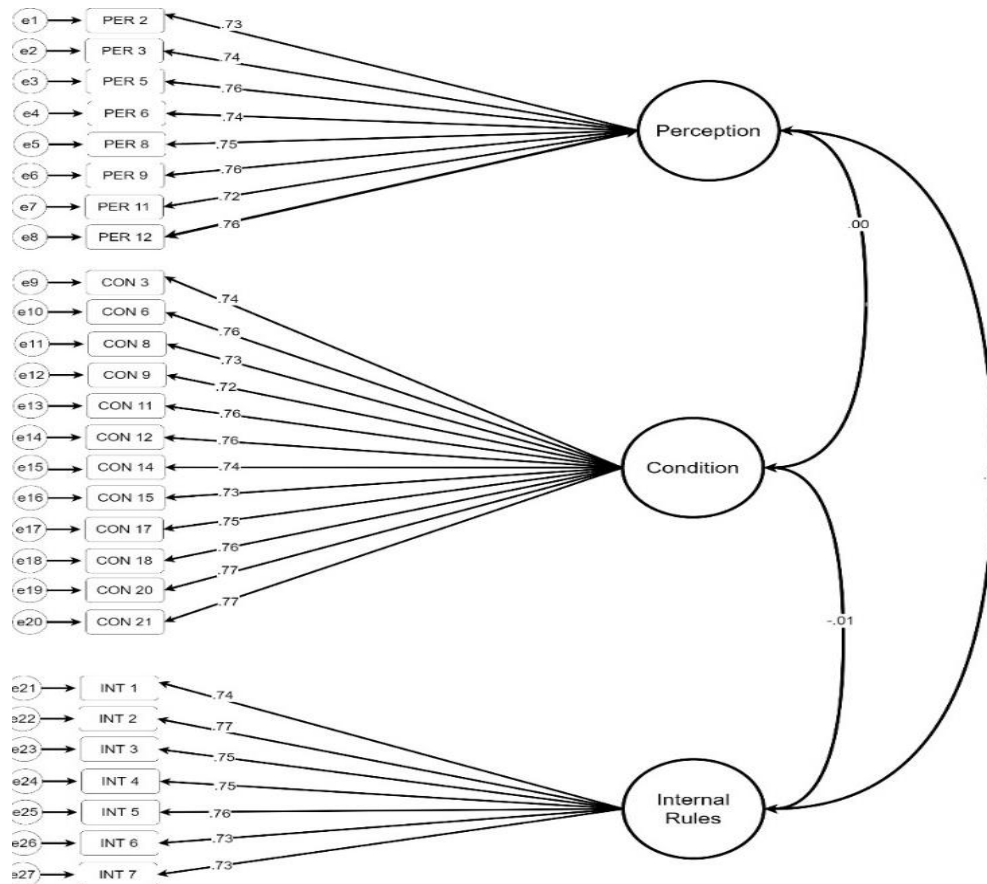


The Confirmatory Factor Analysis (CFA) of Internal Rules (INT) that affected the positive behavior of logistics personnel in the case of public transport drivers Bangkok, Thailand revealed that the empirical data passed the criteria according to the ideas of Hair et al. (2006) and Bollen (1989), indicating that the model was consistent with the empirical data, chi-square=13.539, df=14, p=.485, CMIN/DF=.967, AGFI=.990, GFI=.995, RMSEA=.000, RMR=.006, without proposal for factor loading cut-offs because every line had a value of not less than 0.5.

## 6.2 The Confirmatory Factor Analysis (CFA) of Overall Variables

The Confirmatory Factor Analysis (CFA) of the positive behavioral impact of logistics personnel in the case of public transport drivers in Bangkok, Thailand of the measurement model to verify the construct validity of the elements in each variable contained in the model if they were true according to the theory and concepts that were examined by analyzing the measurement model with a ready-made software according to the measurement model of behavioral impact variables for Perception, Condition, and Internal Rules. Considering empirical data through the criteria according to the concepts of Hair et al. (2006) and Bollen (1989), it showed that the model was consistent with the empirical data, Chi-square= 329.0478, df=322, p=.3813, CMIN/DF=1.0219, AGFI=.9644, GFI=.9696, RMSEA=.0053, RMR=.0136

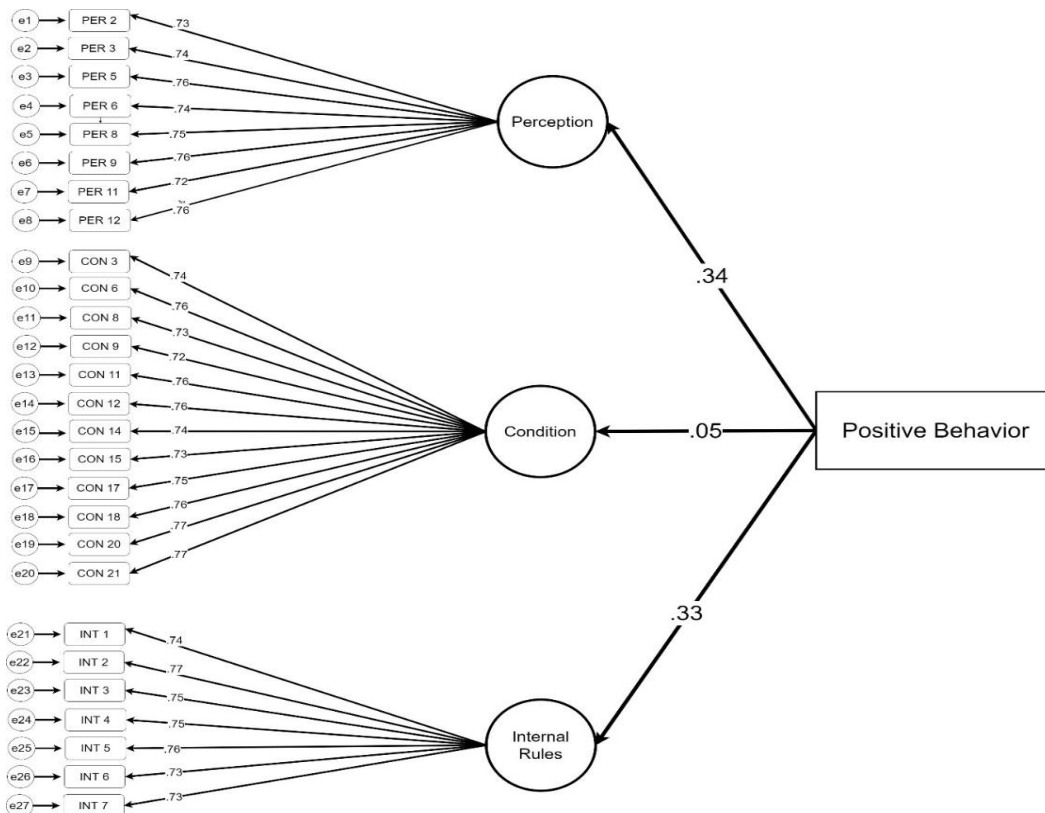
Figure 4: Confirmatory Factor Analysis of all variables



### 6.3 The Confirmatory Factor Analysis (CFA) and the positive behavioral impact of logistics personnel in the case of public transport drivers Bangkok, Thailand

The Confirmatory Factor Analysis (CFA) of the positive behavioral impact of logistics personnel in the case of public transport drivers Bangkok, Thailand revealed that the empirical data passed the criteria according to the ideas of Hair et al. (2006) and Bollen (1989), indicating that the model was consistent with the empirical data, Chi-square=356.6790, df=349, p=.3769, CMIN/DF=1.0220, AGFI=.9632, GFI=.9684, RMSEA=.0054, RMR=.0183

**Figure 5: Structural Equation Modeling of the positive behavioral impact of logistics personnel in the case of public transport drivers Bangkok, Thailand**



**Table 1: Validation Index and Conformance Index of Model against Empirical Data**

Statistics Used to Measure Consistency	Acceptable Level Value	Value	Result
p-value	> 0.05	.3769	Pass
CMIN/DF	< 3	1.0220	Pass
AGFI	> 0.85	.9632	Pass
GFI	> 0.90	.9684	Pass
RMSEA	< 0.08	.0054	Pass
RMR	< 0.08	.0183	Pass

## 7. HYPOTHESIS TESTING

It can be concluded that the proposed confirmatory factor model of positive behavioral impact of logistics personnel in the case of public transport drivers in Bangkok, Thailand was consistent with the empirical data as shown in the table above.

## 8. SUMMARY AND DISCUSSION

The results of the analysis and confirmatory factor analysis of the positive behavioral impact of logistics personnel in the case of public bus driver Bangkok, Thailand. The researcher would like to discuss the results as follows:

**Perception** was consistent with J Chen Wang and others (2018) who studied the effects of safety knowledge and psychological factors on self-reported risky driving behaviors, and with the research result of Sergio A. and others (2019) that studied about Explaining self-reported traffic crashes of cyclists: An empirical study based on age and road risky behaviors, and with Sergio A. and other (2018) that studied Does gender really matter? A structural equation model to explain risky and positive cycling behaviors.

**Condition** was consistent with Wenhui Chu and others (2019), and with Traffic climate, driver behavior, and accidents involvement in China and with Darren Wishart and others (2017) that studied about Thrill and adventure seeking in risky driving at work: The moderating role of safety climate

**Internal Rules** was consistent with Yesim Üzümcüođlu and others (2021) that studied about Investigating driving instructors: The mediating roles of driving skills in the relationship between organizational safety strategies and driver behaviors, and with Sergio A. and others (2019) that studied about Explaining self-reported traffic crashes of cyclists: An empirical study based on age and road risky behaviors

From the hypothesis testing of the confirmatory factor analysis of the positive behavioral impact of logistics personnel in the case of public bus driver Bangkok, Thailand, the proposed model was consistent with the empirical data. The model proposed to measure the impact consisted of following variables, Perception, Condition, and Internal Rules were consistent with the empirical data. It can be used as a measure and indicator for all 3 factors for personnel to express important behaviors which were assumed that positive behavior impact elements are important to logistics personnel. In the researcher's opinion, this study has been thoroughly examined both from the concept theory and data. The results of this research can be established as a standard for better control and supervision, and can be formulated to create a strategic competitive advantage in the future. Additionally, the future research can be conducted in conjunction with the issue of the Driver Behavior Questionnaire (DBQ) for creating clarity of negative behaviors such as Lapses, Error, Ordinary Violations and Aggressive Violations.



## 9. SUGGESTION

### 9.1 Suggestions for applying the research results

The research found that the weight of the positive behavioral impact of logistics personnel in the case of public bus driver Bangkok, Thailand have the values that should be taken into consideration while implementing a driver training program. Therefore, policies that are consistent with the three components of positive behavior while performing tasks should be encouraged to put into practice so that road users and general public can see positive behaviors clearer.

### 9.2 Suggestions for future research

9.2.1 The future research should expand the scope of the study to the national level in order to compare the research results between Bangkok and urban areas of different provinces whether there are different impact components or not.

9.2.2 Research should be conducted on the effectiveness of the supervisor whom public transport drivers report directly to, thus they can provide comprehensive guidelines or standards to supervise drivers in qualitative research to gain more insights.

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