JOE, PETER, JAYDEN & YEOH LOGISTIC PERFORMANCE BLS (HONS) DECEMBER 2024

FACTORS INFLUENCING THE LOGISTICS PERFORMANCE: THE MEDIATING ROLE OF TRUCK DRIVER HAULAGE CRISIS

EMMANUEL JOE A/L STEPHEN RAVI SANKAR
JAYDEN GUEE
MARSYALL PETER
YEOH KAI LUN

BACHELOR OF BUSINESS ADMINISTRATION (HONS) IN LOGISTICS & SUPPLY CHAIN MANAGEMENT

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE
DEPARTMENT OF ENTREPRENEURSHIP AND SUPPLY CHAIN MANAGEMENT

December 2024

FACTORS INFLUENCING THE LOGISTICS PERFORMANCE: THE MEDIATING ROLE OF TRUCK DRIVER HAULAGE CRISIS

BY

EMMANUEL JOE A/L STEPHEN RAVI SANKAR
JAYDEN GUEE
MARSYALL PETER
YEOH KAI LUN

A final year project submitted in partial fulfillment of the requirement for the degree of

BACHELOR OF BUSINESS ADMINISTRATION (HONS) IN LOGISTICS & SUPPLY CHAIN MANAGEMENT

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE
DEPARTMENT OF ENTREPRENEURSHIP AND SUPPLY CHAIN MANAGEMENT

December 2024

DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

(4) The word count of this research report is 11877 words

Name of Student:	Student ID:	Signature:
1. Marsyall Peter	21ABB03199	
2. Emmanuel Joe A/L Stephen Ravi Sankar	21ABB04392	
4. Jayden	22ABB07534	
5. Yeoh Kai Lun	22ABB05518	

Date: 3/12/2024

ACKNOWEDGEMENT

We would like to sincerely thank our research project supervisor, Dr. Yee Chew Fong, for his excellent advice, unwavering support, and tolerance during our final year project. In addition to helping us overcome obstacles, his guidance during our frequent meetings and stimulating discussions added a certain enjoyment to the project's progress. Further, we would like to thank to the examiners Mr. Oon Kam Hoe and Dr. Tan Luen Peng, and Mrs. Hayati for their insightful comments and suggestions have greatly enhanced our project overall and helped to further develop and enhance its overall.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

JD-R	Job Demand-Resource
PLS	Partial Least Squares
SPSS	Statistical Package for the Social Sciences
ATD	Aging Truck Drivers
LW	Low Wages
GDL	Goods Driving License
UWH	Unstandardized Working Hours
TDH	Truck Driver Haulage Crisis
LP	Logistic Performance

LIST OF APPENDICES

PREFACE

This study investigates the factors influencing logistics performance in Malaysia, with a particular focus on the truck driver haulage crisis as a mediating factor. Despite the critical role that truck drivers play in ensuring the efficiency of logistics operations, this sector has received insufficient attention in existing research. The aim of the study is to identify and analyze key factors such as aging truck drivers, low wages, the complexity of obtaining a Goods Driver's License (GDL), and unstandardized working hours, which collectively impact logistics performance. Additionally, the research examines how the truck driver haulage crisis mediates these factors to influence overall performance, providing a nuanced understanding of this vital industry. This study seeks to bridge gaps in the literature by offering insights into the challenges and potential solutions for enhancing logistics performance in Malaysia.

ABSTRACT

This research aims at identifying factors affecting the logistics performance of the country of Malaysia with special reference to the truck driver haulage crisis. This research examines several independent factors that could have initiated the shortage of truck drivers; these include aging population of truck drivers, low wages, the process of acquisition of Goods Driver's License (GDL) and the lack of a standardized working schedule. The following variables are discussed with pertinence to how they worsen the truck driver haulage crisis posited as the central moderator affecting logistics performance in the country. The dependent variable in this research study is logistics performance and it has sub parameters such as delivery time, delivery cost, logistics flexibility and reliability and other similar aspects. By employing a quantitative approach, data were collected from truck drivers from logistics companies and trucking firms operating in key Malaysian ports: Klang, Penang, and Johor. The results suggest that low wages and the centrality of GDL amplifies the severity of the truck driver scarcity affecting logistics performance. Consequently, this research seeks to advance the body of knowledge on the nature and extent of the haulage crisis among truck drivers and provide ideas on the nature of policy changes and industry practises that can help to minimise the effects of shortage on logistics. The paper points out the salience of systematic upgrading of the driver workforce, of easing bureaucratic bearers on hiring, and upward revisions of wages to boost the logistics standing of Malaysian supply chains in the globalizing environment.

Keywords: Logistics Performance, Truck Driver Shortages, Malaysia

Factors Influencing the Logistics Performance: The Mediating Role of Truck Driver Haulage Crisis

CHAPTER 1 : INTRODUCTION

1.1 Research Background

Logistics performance is one of the essential indicators of a country's economic competitiveness since it measures the efficiency of the supply chain as well as the facilitation of trade and is believed to have a significant impact on the prospects for the development of any state's economy (Song & Lee, 2022). On the global level, logistics has got significant in its operation due to the enhanced globalization of the trade, technological enhancements, and time-bound delivery of the products according to the customer's orders (Tien et al., 2019). If we focus on ASEAN region, logistics continues to be an important industry especially in the growing economies whereby there is need to transport goods in order to support the growth of economies (Khan, 2019). Malaysia, being part of the ASEAN member countries cannot be left behind. Logistically the nation benefits from its crucial logistic hub in South East Asia and good transport networks. However, it has been evidenced that the logistics sector of the country has deteriorating performance problems primarily traced to the trucking industry, which is an essential structural component of the logistics system.

The challenges affecting Malaysia's logistics performance include an aging truck driver workforce, low wages for drivers, the complexity of obtaining a Goods Driver's License (GDL), and unstandardized working hours. These issues directly influence the overall efficiency of the logistics sector and customer satisfaction (Rahmata et al., 2021; Chua, 2024). Addressing these challenges is crucial for the development of Malaysia's logistics sector and for improving customer satisfaction.

The truck driver haulage crisis, which entails a major shortage of qualified and competent drivers, is not only a consequence but also acts as a mediating factor that exacerbates the impact of these issues on logistics performance. Past studies highlighted that truck driver shortage can have a considerable impact on the supply chain, which causes delays and higher costs and inefficiencies in the logistics system (Wang et al., 2022). In Selangor for instance, the scarcity of haulage truck drivers is a real tragedy with statistics showing a probable 40% deficiency (Loheswar, Malay Mail, 2024). These are what caused the shortage which is low wages and unstandardized working hours, all of which have led to a shortage of workers and therefore a decline in logistics performance. Other past studies have also shown that the aging of the truck drivers can have an influence on logistics performance (Newnam et al., 2020). The mediating role of truck driver haulage crisis suggest that these factors affect the performance of logistics not only directly, but also through the aggravation of the crisis in the truck driver haulage (Naganawa et al., 2024). It is therefore important to understand this mediating effect in the effort to solve the crisis and enhance efficiency of Malaysia's logistics industry.

1.2 Research Problems

Logistics industry is a critical component of Malaysia's economy where it facilitates trades, supporting industrial growth and enhancement of its global competitiveness. However, the performance of the logistics sector has been experiencing a lot of pressure because of various challenges, which are mainly realised within the trucking industry, which is the core of the logistics. Unfortunately, logistics performance in Malaysia is gradually deteriorating in spite of the country's favorable geographical location and first-rate infrastructure, due to the emerging truck driver haulage issue (Doktoralina & Apollo, 2019).

The shortage of drivers is very severe in the context of Malaysia's trucking industry and has escalated in the recent period. This shortage is exacerbated by multiple factors which are aging truck drivers, low wages, complexity to obtain GDL, unstandardized working hours (Rahmata et al., 2021; Conroy et al., 2022; Reyna et al., 2024). These problems do not only make newer entrants stay away

from the profession but also lead to massive turnovers and burnout of the existing drivers. These factors mean that there is a continuously declining workforce which cannot address the needs of the logistics industry hence causing time inefficiencies and higher operational costs.

The truck driver haulage crisis is a critical issue that not only results from these factors but also acts as a key intermediary in how these challenges collectively affect logistics performance. Past studies have identified the truck driver haulage crisis as a critical issue impacting logistics performance (Gurtu, 2023; Rahmata et al., 2021), yet there has been limited research that comprehensively examines the mediating role of this crisis in the context of Malaysia. Specifically, there is a lack of understanding of the identified factors, which are aging drivers, low wages, complexity to obtain GDL, and unstandardized working hours. This study highlights that the haulage crisis bridges the connection between these factors and the overall logistics performance, emphasizing its importance as a mediator.

This research will try to fill this gap by examining the relationship between truck driver factors and logistics performance with regard to the mediating effect of the truck driver haulage crisis. Understanding of this relationship is therefore vital for identifying targeted strategies to mitigate the driver shortage and enhance the efficiency and effectiveness of Malaysia's logistics sector. The key problems that have been identified as challenges to the improvement of logistics performance have not been sufficiently addressed, and failure to address them may lead to more deterioration of the logistics performance in the country, which in turn has implications on the general development of the nation's economy as well the economies of the ASEAN nations.

1.3 Research Objectives & Research Question

1.3.1 Research Objectives

RO1: To examine the impact of aging truck drivers, low wages, complexity to obtain GDL, and unstandardized working hours towards truck driver haulage crisis.
RO2: To examine the mediating effect of truck driver haulage crisis between aging truck drivers, low wages, complexity to obtain GDL, and unstandardized working hours towards logistics performance in Malaysia.
RO3: To examine the impact of truck driver haulage crisis and logistics performance in Malaysia.

1.3.2 Research Questions

RQ1: Does the influence of aging truck drivers, low wages, complexity to obtain GDL, and unstandardized working hours impact on truck driver haulage crisis.
RQ2: Does truck driver haulages crisis mediates the relationship between aging truck drivers, low wages, complexity to obtain GDL, and unstandardized working hours and logistics performance in Malaysia.
RQ3: What is the impact of truck driver haulage crisis to logistics performance in Malaysia.

1.4 Research Significance

This research is crucial for shaping policies and strategies that address the challenges faced by truck drivers in Malaysia's logistics sector. By examining truck driver factors, the study offers insights for policymakers to create targeted interventions that improve working conditions and alleviate the truck driver shortage (Prapinit et al, 2024). Using the POLC framework (Planning, Organizing, Leading, and Controlling), logistics companies can develop sustainable policies that provide better benefits and working conditions for drivers. This not only enhances

driver retention but also improves overall logistics performance, contributing to a more efficient and competitive industry.

1.5 Scope of the Study

This study focuses on the factors influencing logistics performance in Malaysia, specifically examining the role of the truck driver haulage crisis. The analysis centers on truck drivers and trucking companies operating in major ports which are Port Klang in Selangor, Penang Port in Penang, and Port Tanjung Pelepas in Johor. These ports are crucial for Malaysia's trade activities, making them ideal locations to assess how truck driver factors impact logistics performance. The findings aim to provide insights that can help improve logistics efficiency in these key economic zones.

1.6 Operational Definition

The following definitions are provided to enable a consistent understanding of the terms used in this research.

1.6.1 Aging Truck Drivers

Aging truck drivers relate to the rising average age of Malaysian truck drivers, which is often represented by drivers who are nearing or exceeding the age of 50 (Abdullah & Dawal, 2020). It considers retirement rates, health difficulties, and the influence of an aging workforce on the availability of trained drivers.

1.6.2 Low Wages

The low wages refers to the truck drivers' wages and benefits, which include salary, bonuses, and other financial incentives (Trick et al., 2021). It emphasizes the economic issues that drivers face, such as low pay that do not cover the cost of living or do not provide adequate motivation for newcomers to the industry.

1.6.3 Complexity to obtain GDL

Complexity to obtain GDL relates to the challenges and barriers involved in obtaining a GDL in Malaysia. It covers the legal requirements, the cost, the length of the licensing process, and any other administrative obstacles that potential drivers experience in getting the necessary certification to operate commercial vehicles (Rahmata et al., 2021).

1.6.4 Unstandardized Working Hours

This measures the unpredictability and irregularity of truck drivers' working hours. It includes problems such as long shifts, unexpected schedules, a lack of standardization in work hours, and the subsequent influence on drivers' work-life balance and job satisfaction (Hasan et al., 2022).

1.6.5 Truck Driver Haulages

Truck drivers haulages refers to the insufficient quantity of qualified truck drivers available to meet Malaysia's logistics industry demand. It includes factors such as the supply-demand mismatch, recruitment issues, and the overall availability of experienced drivers to support transportation operations.

1.6.6 Logistics Performance

The logistics performance examines the efficiency and effectiveness of Malaysia's logistics sector. It considers delivery times, transportation costs, service quality and logistics businesses' capacity to meet client needs. It shows the total performance of the logistics industry, which is influenced by both internal and external factors.

CHAPTER 2 : LITERATURE REVIEW

2.1 Introduction

The following chapter includes an overview of the relevant academic literature related to the research subject. Evaluating the literature aids in enhancing understanding of the research problem and identifying areas that have not been explored.

2.2 Underlying Theories

2.2.1 JD-R Theory

The Job Demand- Resources (JD- R) model postulated by Demerouti et al, (2001) was used to describe how demands and resources within the workplace influenced employees' well-being and performance. Chronic source demands including heavy workload time pressure, and emotional stress involve prolonged exerted efforts and may cause strain if not well dealt with (Hossan et al., n.d.). On the other hand job factors such as coworker support, decision authority, and skill training enhance motivation and hinder job demands besides developing the person (Bakker & de Vries, 2021). According to the JD-R model, high levels of job demand cause burnout, resulting in decreased outcomes, while the job resources have the potential of buffering for enhancing outcomes (Bakker et al., 2021).According to Beckers et al.(2008), truck driving is typically characterized by long and overtime working hours. In logistics, which experience shift work, heavy workload, and stress, the theory seeks to ensure that demand does not outdo supply to avoid exhaustion while improving performance (Winkelhaus et al., 2022). Promotive factors which include arousing leisure, performance of monitoring and professional development could reduce stress level and enhance motivation (Bakker & Demerouti, 2017). Hence, employee well-being with organizational outcomes, such as productivity, absenteeism, and turnover, suggesting that by managing job demands and

resources, logistics companies can enhance drivers' well-being, reduce turnover, and ultimately improve organizational performance (Bakker & Demerouti, 2007; Janssen et al., 2004).

2.2.2 Equity Theory

Equity Theory was theories by John Stacey Adams in 1963 and it views employee behaviours in workplace in terms of perceived fairness of exchange. It assumes that motivation comes from the ratio of the efforts, skills, salaries rewards, etc offered to similar employees. Whenever employees experience inequity, for instance giving more while receiving less, they may reduce their inputs, their outputs or their perceptions (Adams 1963). In the area of logistics, we strongly notice that inequity is retarding the performance. Thus, according to Petrescu & Simmons (2008), perceived organisational injustice has a negative effect on motivation, job satisfaction and performance. Truck drivers perceiving workplace inequity for example low pay and unstandardized working hours may be dissatisfied, less effective and have high turnover rates (Leong Weng, 2019; Freeman, 2019). A study by Folger and Konovsky (1989) shows that levels of fairness promote organisational citizenship behaviour and job performance. Reducing unfairness of logistics services, for instance, the pay and conditions of the drivers in relation to their perceptions of fairness, will increase the motivation of the driver which will in turn improve logistics performance (Mok Kim Man & Yie, 2021).

2.3 Review of variables

2.3.1 Logistics Performance

Logistics performance, which encompasses a number of factors like timeliness, quality of infrastructure, and customs efficiency, refers to the effectiveness, dependability, and speed with which items are transferred from producers to consumers (Mengesha, 2020). Due to issues facing the trucking industry, especially the truck driver haulage crisis, logistics performance is

becoming more and more compromised in Malaysia (Rahmata et al., 2021). Economic growth and competitiveness depend on high-performing logistics systems, but these days, aging drivers, low wages, complex licensing processes, and unstandardized working hours have all contributed to a decrease in system performance. According to Moons et al. (2019), enhancing logistics efficiency necessitates a comprehensive strategy that tackles these fundamental problems, whereas detractors contend that greater focus should be placed on more extensive technology and infrastructural advancements (Acciaro et al., 2020).

2.3.2 Aging Truck Drivers

An analysis of the trucking industry noted that the average age of the workers has gradually risen, meaning several drivers are close to their retirement ages (Abdullah & Dawal, 2020). This demographic change is gradually emerging as one of the biggest challenges across the world and it is important in the context of the logistics industry in Malaysia. The aging workforce poses a direct consequence on the ability to meet transportation demands since the number of drivers reduces when they are older (Wang et al., 2022). Due to most of the drivers reaching their retirement age, there is a scarcity of replacement by younger generations, which worsens delays, ineffectiveness, and high operating costs. Previous academics like Staats et al. (2017) have also pointed out that lack of a youthful population amongst the truck drivers is another reason why the logistics performance has gradually dropped as the sustainability and efficiency of the logistics network is put under pressure. However, those have critics arguing that aging drivers are an issue but other factors like working conditions and low wages may contribute to new entrant's' discouragement in the profession (Loheswar, Malay Mail, 2024).

2.3.3 Low Wages

The current wages in the trucking industry are low, meaning that the wages that the drivers receive are not enough given the effort that the drivers have to exert physically as well as mentally (Hege et al. , 2019). Low wages have been found to

be one of the principal causes that discourage potential drivers in Malaysia with the young people being the most affected (Wong & Fung, 2019). This has an effect on logistics performance because wage difference leads to more turn over, drivers shortages and demotivation among existing drivers. Conroy et al., (2022) claim that the trucking industry's incompetence to pay competitive wages contributes significantly to the logistics sector's deteriorating performance since it results in a smaller workforce and poor service standards. Low wages, according to some academics, is a contributing factor, but in order to completely comprehend their effects on logistics performance, they must be taken into account in conjunction with other factors including working conditions and regulatory hurdles (LeMay & Keller, 2019).

2.3.4 Complexity to Obtain GDL

The complexity of acquiring a Goods Driver's License (GDL) is brought about by the rigorous standards, lengthy training and expensive licensing procedure in Malaysia. Potential drivers find it difficult to enter the market as a result of this complexity, which exacerbates the drivers shortage and negatively affects logistics performance (Rahmata et al., 2021). The number of competent drivers is limited by the difficulty of obtaining a GDL, which raises operational expenses, causes delays, and reduces efficiency in the logistics industry. Rahmata et al., (2021) have highlighted how the regulatory environment, although important for safety, unintentionally prevents the trucking industry from expanding, which has an impact on logistics performance. According to Manrique Vega (2024), maintaining high standards and safety requires the GDL process' intricacy.

2.3.5 Unstandardized Working Hours

Unstandardized working hours are erratic and frequently long workdays that truck drivers must put in, which can cause stress, burnout, and dissatisfaction with their jobs (Reyna et al., 2024). Due to high turnover rates and drivers' reluctance to stay

in the field, Malaysia's lack of set working hours hurts logistics performance. Drivers find it difficult to establish a work-life balance due to the unpredictable nature of work schedules, which has an impact on their motivation and productivity (Hinder & Arackal, 2023). According to Okazaki et al. (2019), unstandardized working hours are a major contributor to the logistics industry's deteriorating performance since they cause inefficiencies and delays in the delivery of goods. While working hours are a concern, other academics contend that the primary causes of the issue are the general working conditions and inadequate compensation of drivers (Peters et al., 2021).

2.3.6 Truck Driver Haulage Crisis as a Mediator

The significant shortage of qualified drivers, which acts as a mediating factor aggravating the effects of aging drivers, low wages, the complexity of obtaining a GDL, and unstandardized working hours on logistics performance, is known as the "truck driver haulage crisis" (Rahmata et al., 2021; Okazaki et al., 2019; Conroy et al., 2022) The haulage crisis is shortage of truck drivers in the trucking industry leading to supply chain disruptions, which in turn causes delays, higher expenses, and less dependability in the logistics industry. According to Wang et al. (2022) and Duckering (2022), there is a substantial negative correlation between these independent variables and logistics performance that is amplified by the truck driver shortage. Critics contend that although the haulage crisis is a serious problem, its resolution and the improvement of logistics performance depend on addressing the underlying causes, such as wages and working conditions (Pourrahmani & Jaller, 2021).

2.4 Proposed Theoretical/ Conceptual Framework

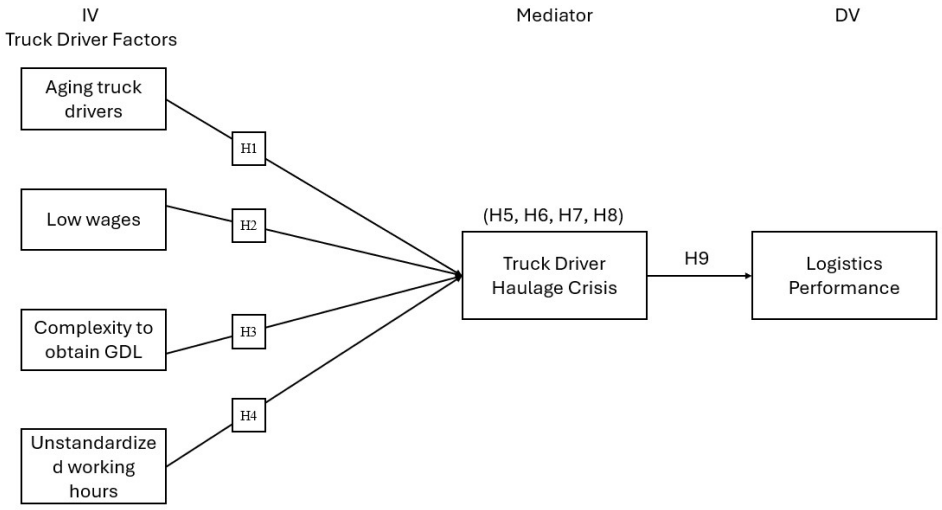


Figure 2.1: Proposed Conceptual Framework

2.5 Hypotheses Development

2.5.1 Relationship between aging truck drivers and truck driver haulage crisis

According to Rashmi & Marisamynathan (2023), aging deteriorates the competence of drivers mainly because; the driver loses his/her ability to think, coordinate his muscles adequately, and accomplish other physical tasks. Especially, older drivers are at a higher risk of the accident because their capability of smelling, seeing and hearing declines with age. Based on Hamido et a. (2021), there is a rising driver shortage in the trucking sector as fewer young people fit the recruiting requirements. Delaying the retirement age has become essential to assist offset the shortage and sustain the economy, which makes the problem worse in aging populations. As a result, the current study intends to evaluate whether there is a significant impact between aging truck drivers and truck driver haulage crisis, which leads to the first hypothesis:

H_1: There is a significant impact between aging truck drivers and truck driver haulage crisis

2.5.2 Relationship between low wages and truck driver haulage crisis

The problem of fairly reasonable salary has also been experienced for long in the trucking industry particularly regarding lack of pay for non-driving hours. Low wages are considered as compensation that is proven to be insufficient by truck drivers for their work. Low wages can lead to financial strain for truck drivers and potentially impacting their job satisfaction and overall well-being. Low wages can also make change the way drivers perceive the benefits and drawbacks of the occupation and their desire to remain in the trucking industry. As a result, the current study intends to evaluate whether there is a direct impact between low wages and truck driver haulage crisis, which leads to the second hypothesis:

H_2: There is a significant impact between low wages and truck driver haulage crisis

2.5.3 Relationship between complexity to obtain GDL and truck drivers haulage crisis

To drive a company vehicle one needs a Goods Driving License also referred to as Goods Vehicle License. It is divided into three categories: jointed vehicles which include trailers, containers, and tanks falls under the GLD Class E Jointed, stiff or rigid heavy vehicles fall under GDL Class E and light vehicles in GDL Class D (Rahmata et al., 2021). However, in order for the truck drivers to obtain the GDL licence, one must go through a health examination and they are expected to have a good and satisfactory standard of health. On the other hand, the price of practical training in obtaining a GDL is extremely expensive (Rabbiatul Putri, 2024). As a result, the current study intends to evaluate whether there is a significant impact

between the complexity to obtain GDL and truck driver haulage crisis, which leads to the third hypothesis:

H_3: There is a significant impact between complexity to obtain GDL and truck drivers haulage crisis

2.5.4 Relationship between unstandardized working hours and truck driver haulage crisis

Unstandardized working hours is where the working hours of truck driver is not consistence whether the working hours is long or the work shift is not resonable. The working hours will impact the truck driver rest-work pattern. When the truck driver working for the night shift, they need to remain high attention when they are driving and it may result in lack of sleep to the driver itself. Consistency of driving for night shift may impact in the level of stress to the driver itself and it will affect the intension toward their work (Shabadin et al.,2022). According to Hasan et al (2022), it conclude that there are 21.5% of the truck driver in Malaysia are sleep less than 6 hours. Apart from that, it also state that 42% of the truck driver is having fatigue problem during their working time. Hence, the study is to determine whether unstandardized working hours have a significant impact to the truck driver haulage crisis which lead to the forth hypothesis:

H_4: There is a significant impact between unstandardized working hours and truck driver haulage crisis

2.5.5 Mediating effect of truck driver haulage crisis, aging truck drivers and logistics performance

According to Hamido et al, (2021), that there will be a fovourable impact in employment rate due to the e-commerce industry growth. There are numerous managerial challenges facing logistics firms, one of which is a shortage of available

drivers. The driver shortage has for long been a challenge facing the transportation and logistics industry Automation has arrived into the industry yet it is designated for management, administration, and driving. A poor quality driver, lack of driver, or no drivers will definitely dent the organisation by reducing productivity, compromising the organisation's quality of services it delivers to its clients and thus compromising its much needed competitive stake in the market place (Ji-Hyland & Allen, 2022). As a result, the current study aims to evaluate whether truck driver haulage crisis influence the impact between aging truck drivers and logistics performance, which leads to the following six hypotheses:

***H*5: Truck driver haulage crisis mediates the relationship between aging truck drivers and logistic performance**

2.5.6 Mediating effect of truck driver haulage crisis, low wages and logistics performance

Truck drivers who are paid low wages for their labor as revealed by the current study are those who are paid below what may be considered standard wages in the occupation. Truck drivers that are paid poorly may end up struggling to make ends meet which may have an impact on their performance, health and job satisfaction (Kudo & Belzer, 2019). Perceptions from the truck drivers on the compensation they receive will also influence their attitude on the advantages or disadvantages of continuing practicing as truck drivers (Trick & Peoples, 2021).Consequently, this can impact the effectiveness of logistics by affecting the productivity, dependability, and total value that drivers bring to the supply chain. As a result, the current study aims to evaluate whether truck driver haulage crisis influence the impact between low wages and logistics performance, which leads to the following six hypotheses:

***H*6: Truck driver haulage crisis mediates the relationship between low wages and logistic performance**

2.5.7 Mediating effect of truck driver haulage crisis, complexity to obtain GDL and logistics performance

According to the current study, truck drivers that could not obtain a GDL in their jobs would result in truck drivers shortages in the logistics industry. Due to the requirement of having a good health standard and the requirement to attend expensive practical training courses, truck drivers find it difficult for them to enrol in the logistics industry as not every truck drivers could afford such expenses and are not expected to maintain a good health standard since they are having unstandardized working hours (Rahmata et al., 2021; Nasir, 2021). All these situations that are happening are not encouraging for truck drivers as they are obstacles along the way in getting a GDL (Rahmata et al., 2021). As a result, the current study aims to evaluate whether truck driver haulage crisis influence the impact between complexity to obtain GDL and logistics performance, which leads to the following six hypotheses:

***H*7: Truck driver haulage crisis mediates the relationship between complexity to obtain GDL and logistic performance**

2.5.8 Mediating effect of truck driver haulage crisis, unstandardized working hours and logistics performance

Based on this study, a long working hours for truck drivers will cause the truck driver toward fatigue during working time. When they feel fatigue, the truck driver may stop at the roadside and take a rest during their working hours.(Hasan et al.,2022) Not only this, night shift will also affect their performance because the driver need to remain high focus during the night time and it is stressful to the driver itself (Shabadin et al.,2022). Hence, the aim of the study is to determine whether truck driver haulage crisis will influence the impact on unstandardized working hours and logistics performance, which lead to the eight hypothesis:

***H*8: Truck driver haulage crisis mediates the relationship between unstandardized working hours and logistics performance**

2.5.9 Mediating effect of truck driver haulage crisis and logistics performance

Lack of truck drivers has turned out to be a big concern across logistics and freight. This condition will result in increased delivery times, increased transportation cost, and overall reliability in the supply chain lowering (Wang et al., 2022). This disruption can affect the stocks to be made available in the market, increase the cost of doing business especially for those that rely on ground transport and potentially lead to inflationary pressures on consumer goods. As a result, the current study seeks to evaluate whether truck driver haulage crisis mediate the logistics performance, leading to the ninth hypothesis:

H_9: There is a significant impact between truck drive haulage crisis and logistics performance

CHAPTER 3 : METHODOLOGY

3.1 Introduction

The methodology for the research is described in this chapter. In order to investigate the influence between the variables and the mediator towards the logistics performance, this chapter will address the research designs and appropriate methodology used in study.

3.2 Research Design

Since quantitative research was the primary approach used in thisx investigation, descriptive research was employed as the quantitative research design type in this study. Descriptive research, according to McCombes (2019), attempts to accurately and completely define a population, circumstance, or phenomena. The study's research design is shown in Figure 3.1.

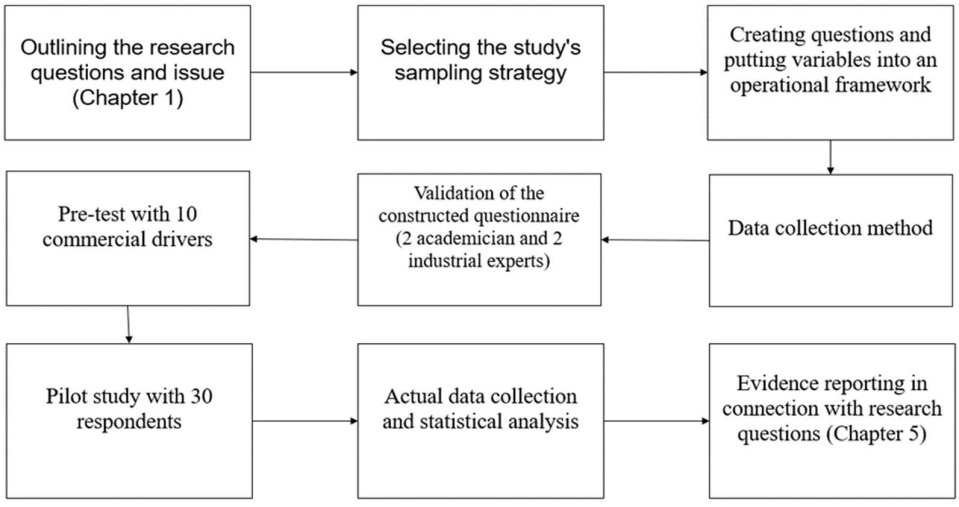


Figure 3.1: Research Design

3.3 Sampling Design

3.3.1 Target Population

This study focuses on truck drivers in three main regions of Malaysia's logistics industry which are Johor, Penang and Selangor. Port Klang, one of the nation's principal ports, is located in Selangor. Penang port located in Penang serves as a manufacturing and export hub, while Port Tanjung Pelepas located in Johor is essential to cross-border logistics because of its closeness to Singapore and the existence of Johor Port. Together, these regions provide a comprehensive perspective on the factors influencing the truck driver haulages in Malaysia.

3.3.2 Sampling Size

This study will use the G*Power 3.1 Sample Size Calculator, an evidence-based measure of impact size, to determine the sample size because it may be estimated. G*Power Sample size calculations quantify the impact, demonstrate increased empirical rigor on the side of the investigators, and enhance the study's internal validity (Faul et al., 2009). In this particular study, there are five predictors; therefore, 138 respondents are required overall.

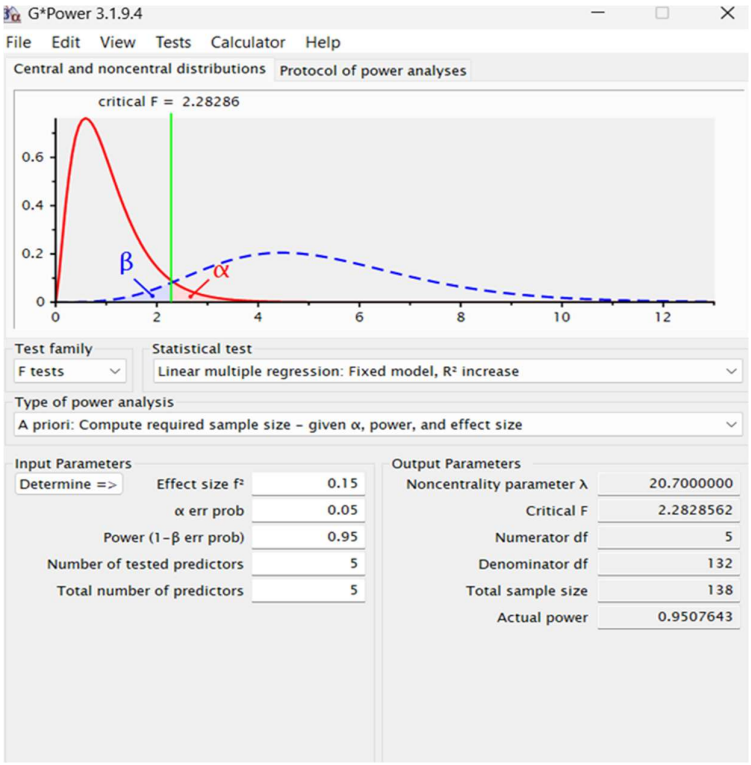


Figure 3.2: G*Power 3.1 Sample Size Calculator

3.3.3 Sampling Process

In this study, electronic and physical types of questionnaires were used to collect data from the samples. An electronic method of data collection was used in this study through the use of Google Forms for constructing questionnaires, which were shared on social media platforms like, Facebook, Instagram, and WhatsApp. Besides, there were paper surveys that were given to participants as physical questionnaires for each of the participants. This combination of methods ensured a straightforward and efficient approach to collecting data from a diverse group of respondents (Karunarathna et al., 2024).

3.3.4 Sampling Technique

Sampling techniques can be categorized into probability and non-probability sampling methods (Adeoye, 2023). In this study, probability sampling, specifically simple random sampling, was chosen. This method is effective because it ensures that every truck driver and trucking company in the targeted regions, Selangor, Johor, and Penang has an equal chance of being selected. By eliminating bias in participant selection, this sampling technique allows for a more representative and generalizable dataset (Bhardwaj, 2019). It aligns with the study's objectives by providing a fair and random distribution of participants, ensuring the data collected reflects the broader population's characteristics (Bhardwaj, 2019).

3.4 Data Collection

Data collecting is the first step in research that can improve the quality of results collected by lowering the possibility of errors occurring throughout a research effort. There are two categories of data collection which are primary data (Taherdoost, 2021). In this research, secondary data collection is employed.

3.4.1 Primary Data

Primary data collection entails communicating with respondents face-to-face or obtaining first-hand information from the source. Using this method, researchers can collect primary data that aligns with their objectives (Mazhar et al., 2021). Research using primary data typically requires more time and effort to gather and analyze than research using secondary data.

3.5 Research Instruments

3.5.1 Questionnaire Design

Respondents to the questionnaire survey are given limited options through fixed-alternative questions. The questionnaires are divided into seven sections. The demographic profile, found in Section A, contains information about the respondents' age, gender, education level, and others. The topics covered in this questionnaire are: (B) aging truck drivers; (C) low wages; (D) complexity to obtain GDL; (E) unstandardized working hours; (F) truck driver haulage crisis; and (G), logistics performance, which is the dependent variable.

3.5.2 Operationalization of Variables

A type of assessment scale called the 5-point Likert Scale allows respondents to indicate how much they agree or disagree with the provided statement on a positive to negative scale. Thus, the 5-point Likert scale assesses the respondent's attitude and indicates the extent of agreement with a particular statement (Urcádiz Cázares & Monroy Ceseña, 2022). The questionnaire has seven parts in total. To further improve its similarity to interval data, the 5-point Likert scale is categorised as an ordinal scale and modifies the language of the second and fourth responses choices (Hutchinson, 2021). In addition, a standard 5-point Likert item has a descriptive key and a numerical representation for the various levels of agreement.For example, the coding assigns a value of 1 for “strongly disagree,” 2 for “disagree,” 3 for “neutral,” 4 for “agree,” and 5 for “strongly agree.”

Table 3.1: Operationalization of Variables

Section	Variable	Measurements	Scale Technique
A	Gender	Nominal	Close ended-question
	Age	Ordinal	Multiple choice question
	Education Level	Ordinal	Multiple choice question
	Working experience in trucking company	Ordinal	Multiple choice question
	Industry	Ordinal	Multiple choice question
B	Aging Truck Drivers	Ordinal	5-points Likert scale
C	Low wages	Ordinal	5-points Likert scale
D	Complexity of obtain Goods Driving License (GDL)	Ordinal	5-points Likert scale
E	Unstandardized Working Hours	Ordinal	5-points Likert scale
F	Truck driver's haulage crisis	Ordinal	5-points Likert scale
G	Logistics Performance	Ordinal	5-points Likert scale

3.5.3 Pre-Test

Before the real questionnaire is administered, pretesting can guarantee the questionnaire's prospective efficacy (Reynolds et al., 1993). One pretesting strategy for this strategy will be expert evaluations. Review and recommendations for improvement are given by 10 commercial vehicle drivers.

3.5.4 Pilot Study

Instead of being carried out on a larger scale, the pilot study was carried out on a smaller one. The participants in this study will be given 30 questionnaires as part of a pilot study. Johanson and Brooks (2010) said that the researchers recommended a minimum of 30 respondents from the interested groups for a preliminary survey or scale development.

Table 3.2: Reliability analysis of 30 commercial vehicle drivers

Variables	Cronbach Alpha
ATD	0.821
LW	0.925
GDL	0.960
UWH	0.923
TDH	0.794
LP	0.962

3.6 Data Processing

Data processing refers to the collection of data that is raw and the subsequent conversion of the data into usable information. More simplified, processing entrails the collection, manipulation, and output of raw data into meaningful information. Raw data is gathered, sorted, analyzed, evaluated, archived and conceptualized so that it can easily be understood. As such, it provides the right context and setting

for computer interpretation and also allows its use by staff members in the organization (Duggal, 2023).

3.6.1 Data reliability and validity

Validity and reliability are two crucial aspects to take into account when assessing the study's quality. They show how accurately a test, strategy, or method measures something. According to Ross (2019), validity refers to how well a method measures what it is designed to measure, whereas reliability is the consistency with which it assesses something.

3.6.2 Data Validity

Maintaining data quality and integrity in databases is aided by data validity, which is a measure of the accuracy and dependability of data and ensures that it satisfies predetermined standards or guidelines (Strom, 2001). Two academicians and two industrial experts validate the questionnaire that was created.

3.6.3 Data Analysis

Making decisions based on facts is possible through the use of data analysis, which purges, modifies, and extracts valuable information from data (Johnson, 2022). The data analysis process includes identifying, gathering, cleaning, preparing, analyzing, and interpreting analysis results (Coursera, 2022). Pre-screening of the data was done while gathering the original data. Every questionnaire response was collected, and it was reviewed to make sure no questions were left unanswered. This study used the partial least squares (SmartPLS) version 4.1.0.3, where the primary data was entered for analysis and all questions were coded with numerical values.

3.7 Proposed Data Analysis Tool

3.7.1 Descriptive analysis

Descriptive analysis provides comprehensive, precise, reliable, and impartial information about objects. In order to minimize bias, it produces such data by using people as measuring devices in controlled environments. By using the frequency and percentage distribution, along with the respondents' sociodemographic information and Likert scale distribution, the analysis turned the numerical data into meaningful information.

3.7.2 Reliability Analysis

We can look into the characteristics of measuring scales and the components that make them up with reliability analysis. Furthermore, accuracy and consistency are what reliability in measurement refers to. A collection of metrics for internal consistency or reliability is measured by Cronbach's alpha. According to Habidin et al. (2015), Cronbach's Alpha Rule of Thumb states that values of 0.70 or higher are favored while values of less than 0.6 should be avoided as they may lead to unforeseen issues.

Table 3.3: Cronbach's Alpha Rule of Thumb

Cronbach's Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Acceptable
$0.6 \leq \alpha < 0.7$	Questionable

$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

Source: From Habidin et al. (2015).

3.7.3 Inferential Analysis

Ling et al. (2022) state that inferential analysis is used to draw general conclusions about the characteristics of the population based on data from the population sample. Using data collected from a population sample, inferential analysis determines and evaluates the validity of conclusions about the full population (Guetterman, 2019). When considering the complete population, inferential analytic results will always include some degree of uncertainty.

3.7.3.1 Pearson Correlation Coefficient

The degree of correlation between various variables was ascertained using Pearson correlation. It is measured to what extent the two continuous variables are correlated (Xu & Deng, 2017). Because of its value in assessing the connections between the mediator and the dependent variable as well as the linkages between the independent variables and the mediator, Pearson's Correlation Coefficient analysis was selected for this study (Nunnally, 1975).

Table 3.4: The Scale of Pearson's Correlation Coefficient

The scale of Correlation Coefficient	**Value**
$0 < r \leq 0.19$	**Very Low Correlation**

0.2 ≤ r ≤ 0.39	**Low Correlation**
0.4 ≤ r ≤ 0.59	**Moderate Correlation**
0.6 ≤ r ≤ 0.79	**High Correlation**
0.8 ≤ r ≤ 1.0	**Very High Correlation**

Source: (Selvanathan, Jayabalan, Saini, Supramaniam, & Hussin, 2020)

3.7.3.2 Linear Regression Analysis

By fitting a linear equation to observed data points, linear regression analysis is a statistical technique that explains and examines the relationship between a dependent variable and one or more independent variables. Finding the best-fitting line that minimizes the difference between the equation's anticipated and observed values is the primary objective of linear regression (Weisberg, 2005; Pardoe, 2020).

3.7.3.3 Mediation Analysis

When metrics of the mediating process are available, one effective method to enhance the insights gained is through mediation analysis. This study utilized SmartPLS for mediation analysis, leveraging its capability to assess indirect effects within a structural equation modeling framework. SmartPLS facilitates the evaluation of mediation effects and provides robust results by analyzing path relationships between variables (Sobaih & Elshaer, 2022).

Ethical Clearance

Prior to beginning the data collection process, the researcher will request for ethical clearance and receive approval from the Universiti Tunku Abdul Rahman (UTAR) Scientific and Ethical Review Committee (SERC). Because this study gathers original data from human subjects and students from eight carefully chosen colleges, clearance is required. Furthermore, the investigator will guarantee adherence to all UTAR-mandated codes of conduct for human subjects research.

CHAPTER 4 : DATA ANALYSIS AND RESULTS

4.1 Introduction

This chapter covers the descriptive analysis of the data and model specification using SmartPLS software. Various tests were evaluated for the measurement model, including construct validity, convergent validity, discriminant validity, reliability, and dataset normality. The goodness of fit for the structural model was evaluated through tests such as multi-collinearity analysis, effect size (f^2), predictive power (R^2), and predictive relevance (Q^2) analysis.

4.2 Descriptive Analysis

The data collection involved 200 respondents from major logistics hubs in Malaysia, with 90 from Selangor, 60 from Penang, and 50 from Johor. Respondents included 165 males (87.5%) and 35 females (12.5%), predominantly aged 31-40 years. Most had at least STPM/Diploma/SPM qualifications (n=89, 49.5%) and 5-10 years of experience (n=81, 45.5%). Roles varied across management levels, with 101 (60.5%) in non-management positions, 31 (18%) in first-line management, 57 (31%) in middle management, and 11 (5.5%) in top management. Most logistics companies employed 51-100 staff (n=80, 45%) and were primarily Private Limited entities (n=77, 40.5%), followed by Sole Proprietor (n=39, 21.5%), Public Listed (n=33, 16%), SMEs (n=30, 15%), and Partnerships (n=21, 10.5%). Business types included Transport Industries (n=65, 37.5%), Logistics (n=51, 25.5%), Logistics Service Providers (n=41, 21.5%), and Courier Companies (n=43, 21.5%). (Refer Appendices).

Table 4.1: Summary of Respondents' Demographic Details

Respondent's Details	Frequency	Percentage (%)
Gender		
Male	165	82.5
Female	35	17.5
Age		
20 and below	4	2
21-30 years old	44	22
31-40 years old	70	35
41-50 years old	56	28
51 and above	26	13
Education Level		
PHD	6	3
Master's Degree	31	15.5
Bachelor's Degree	74	37
STPM/Diploma/SPM	89	44.5
Working experience in the trucking company		
Less than 5 years	63	31.5
5-10 years	81	40.5
More than 10 years	56	28
Industry		
Logistics	51	25.5
Transport	65	32.5
Logistics Service Provider	41	20.5
Courier Company	43	21.5

Table 4.2 shows the means and standard deviations of variables and dimensions in this study. All scores were above the midpoint of the scale (2.50). According to Hair et al. (2022), means scores (M) below 2.50 were considered low, means scores between 2.51 and 4.00 were classified as moderate, and mean scores above 4.01 indicated high mean scores.

Table 4.2: Mean and Standard Deviation of Each Variables

Variable	Mean	Standard Deviation
LP	3.81	1.06
TDH	4.13	0.88
ATD	4.16	0.79
LW	4.25	0.76
GDL	3.93	0.96
UWH	4.19	0.86

The variable with the highest mean score was low wages (M=4.25, SD=0.76), indicating strong respondent awareness of its significance among truck drivers. Unstandardized working hours followed (M=4.19, SD=0.86), reflecting awareness of challenges caused by irregular schedules. Aging truck drivers (M=4.16, SD=0.79) and the truck driver haulage crisis scored M=4.13, SD=0.88, showing moderate awareness of the truck driver shortage in Malaysian logistics. The complexity of obtaining a Goods Driving License (M=3.93, SD=0.96) also scored highly, highlighting critical issues like an aging workforce and licensing difficulties in the industry. Logistics performance, with the lowest score (M=3.81, SD=1.06), indicates moderate performance, suggesting room for improvement compared to global logistics efficiency. The findings imply gradual adjustments by logistics companies to meet industry demands.

4.3 Model Specifications

In the domain of second-generation multivariate data analysis method known as Structural Equation Modeling (SEM), there are two distinct models: the

structural model and measurement model (Hair at al., 2020). Hair et al. (2022) distinguishes between the structural model, which explores the relationship between independent and dependent variables, and the measurement model, which examines the relationships among all variables and their indicators. In this study, the research model was examined and analyzed using the Partial Least Squares (PLS) approach, specifically employing the SmartPLS 4.0 software (Sarstedt et al., 2024).

4.3.1 Building the Structural Model

The structural model was constructed within SmartPLS, aligning with the research framework to fulfill the outlined research objectives and hypotheses (Henseler & Schuberth, 2020). Figure 4.1 illustrates the constructed structural model of the study. The purpose of establishing the structural model was to demonstrate the significant relationships between the variables and examine the significant relationship between the dependent variable (Logistic Performance) and independent variables (Aging Truck Drivers, Low Wages, Complexity to Obtain Goods Driving License And Unstandardized Working Hours), with the mediating effect of the Truck Driver Haulage Crisis variable among truck drivers in Malaysia.

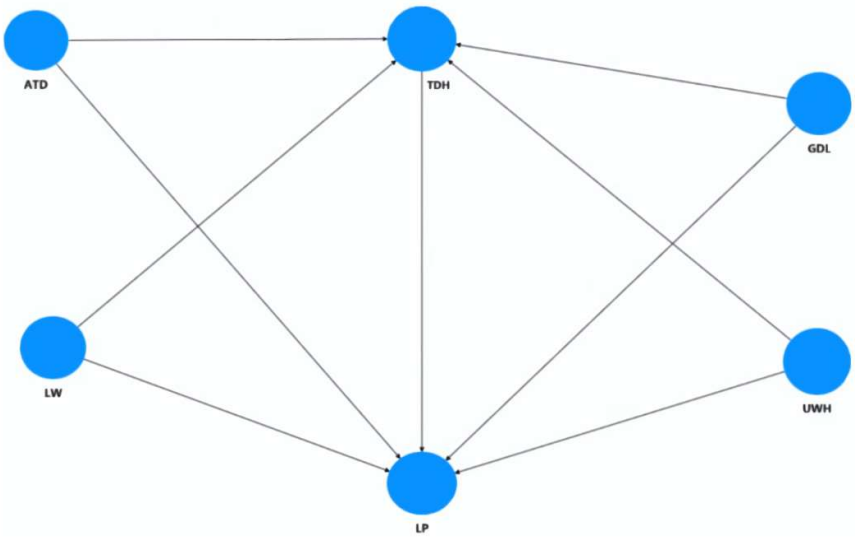


Figure 4.1. Structural Model

4.3.2 Building the Measurement Model

Structural equation modeling (SEM) is divided into two primary measurement scales: formative and reflective. Typically, a formative measurement scale comprises indicators that are not interchangeable, whereas a reflective measurement scale consists of indicators that are highly correlated with each other. Cheung et al. (2024) recommend that reflective measurement can measure average variance extracted (AVE), composite reliability (CR), and so on to examine and reporting the reliability and validity of indicators (Dash & Paul, 2021). Other than that, Hair et al. (2020) also argue that reporting indicators' reliability and discriminant validity is not meaningful for the formative measurement scale when dealing with uncorrelated measures. However, this study utilized a reflective measurement scale for all variables. Figure 4.2 presents the completed measurement model.

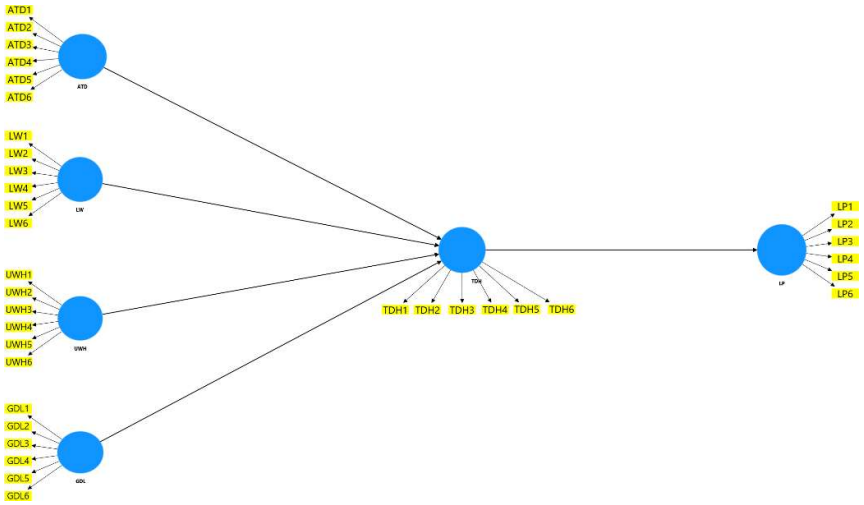


Figure 4.2: Measurement Model for Logistic Performance

4.3.3 Common Method Variance

Common method variance (CMV) refers to systematic error variance in collected data, potentially causing discrepancies among variables (Jordan & Troth, 2020). This study employed two techniques to test for CMV. The first was Harman's single factor test, which examines if a single factor accounts for the variance in variables

(Bagozzi et al., 1991; Jordan & Troth, 2020). Using SPSS Version 23 for sorting and analysis, unrotated factor analysis revealed a variance of 43.61%, below the 50% threshold, indicating no CMV. The second technique, inter-construct correlation, checks if correlations between variables exceed the 0.9 threshold (Bagozzi et al., 1991). In this study, correlations ranged from 0.239 (Logistics performance – Unstandardized working hours) to 0.825 (Low wages – Complexity to obtain Goods Driving License), with none exceeding 0.90. Thus, no CMV was present.

Table 4.3: The Principal Constructs Inter-Correlation

No.	Variable	1	2	3	4	5
1	**LP**					
2	**TDH**	.436				
3	**ATD**	.349	.536			
4	**LW**	.266	.579	.806		
5	**GDL**	.343	.538	.754	.825	
6	**UWH**	.239	.509	.628	.731	.724

4.4 Assessment of Measurement Model

Convergent validity and discriminant validity were the two major types for evaluating the measurement model's validity. Hair et al. (2020) mentioned that convergent validity assesses whether all variables in the research model align in the same direction to measure a specific concept. Theoretically, the variables should exhibit strong correlations with each other (Hair et al., 2022). On the other hand, discriminant validity confirms that each variable is distinct and unrelated to the others (Abubakar et al., 2024).

4.4.1 Convergent Validity

Memon et al. (2020) outlined three methods for assessing convergent validity in a measurement model: factor loading, average variance extracted (AVE), and

composite reliability (CR). Factor loading evaluates the strength of relationships between observed variables and their underlying factors, with scores below 0.4 warranting removal, scores between 0.5 and 0.7 requiring further consideration, and ideal scores ranging from 0.7 to 1.0 (Fabrigar & Petty, 1999; Hair et al., 2020). In this study, retained items had loading scores between 0.627 and 0.908. For AVE, a value above 0.50 is necessary for satisfactory validity, indicating that at least 50% of the variance in indicators is explained (Fornell & Larcker, 1981; Hair et al., 2022). All variables in this study achieved AVE values ranging from 0.568 to 0.753, meeting this criterion. Composite reliability (CR) further assesses internal consistency, with values above 0.70 considered reliable (Lai, 2021). The study's variables exhibited CR values between 0.852 and 0.964, demonstrating high reliability and an adequately validated measurement model (Henseler & Schuberth, 2020).

4.4.1.1 Discriminant Validity

Discriminant validity tests are typically conducted to ensure the absence of relationships between variables. Table 4.4, which displays the square root of the average variance extracted values and correlation values, is prepared to assess discriminant validity. This table allows for a comparison of values among variables. Suppose the square root of the AVE value surpasses the correlation values in the corresponding row and column. In that case, it indicates that the variable meets the criterion for satisfactory discriminant validity in Table 4.4. Therefore, all variables demonstrated higher values with their indicators than other variables tested, affirming their discriminant validity in this study.

Table 4.4: Discriminant Validity of Measurement Model

No.	Variable	1	2	3	4	5	6
1	LP	**0.758**					
2	TDH	0.606	**0.778**				
3	ATD	0.419	0.627	**0.838**			
4	LW	0.343	0.645	0.719	**0.774**		
5	GDL	0.391	0.645	0.785	0.747	**0.823**	

6	UWH	0.297	0.579	0.639	0.747	0.746	**0.873**

Despite this, Henseler and Schuberth (2020) proposed an alternative method to evaluate the reliability of discriminant validity using the heterotrait-monotrait ratio of correlations (HTMT), based on the multitrait-multimethod matrix. They argue that this method provides a more comprehensive measure of discriminant validity than the approach suggested by Fornell and Larcker (1981). The heterotrait-monotrait ratio of correlations criterion can be analyzed through two methods, there are criterion test and statistical test. Dirgiatmo (2023) recommend that the threshold value should not exceed ($HTMT_{0.90}$) for the criterion test (see Table 4.5). The highest correlation observed between the variables in this study was 0.899, which was between Low wages (LW) and the Complexity of obtaining a Goods Driving License (GDL), surpassing the HTMT criterion of 0.90.

Table 4.5: Heterotrait-Monotrait (HTMT)

No.	Variable	1	2	3	4	5
1	LP					
2	TDH	**.699**				
3	ATD	**.496**	**.629**			
4	LW	**.395**	**.667**	**.859**		
5	GDL	**.464**	**.643**	**.827**	**.899**	
6	UWH	**.354**	**.607**	**.678**	**.796**	**.797**

4.4.1.2 Cross Loadings

The cross-loading process aims to determine whether the item's loadings from measured variables are more significant than the item's cross-loadings from other variables. Based on Hair et al. (2022), the difference between the loadings of variable items should range between 0 and 0.10. Additionally, Hair et al. (2020) suggest retaining items with loadings greater than 0.70, while items below 0.40 can compromise the validity of the variable and simultaneously inflate the values of composite reliability (CR) and average variance extracted (AVE). Hair et al. (2022) indicate that greater CR and AVE values enhanced the acceptance level for

reflective variables in terms of convergence. Appendix C illustrates that all item loadings surpass the threshold of 0.70.

4.4.2 Assess the Construct Reliability

The next step involved conducting the analysis of construct reliability. Typically, Cronbach's Alpha is used to assess construct reliability, which measures the data consistency. Cheung et al. (2017) indicates that 0.7 is the minimum value for acceptable consistency. On the other hand, Lai (2021) mentioned a composite reliability threshold of at least 0.7. Therefore, this study adopted the criterion that a reliability value of at least 0.7 is acceptable. Table 4.6 presents the values of all the variables where all the variables demonstrate high reliability exceeding the threshold value of 0.70.

Table 4.6: Reliability Analysis of Measurement Model

Variables	Composite Reliability	Cronbach's Alpha
Logistic performance	0.852	0.755
Truck driver haulage crisis	0.919	0.894
Aging truck drivers	0.958	0.950
Low wages	0.947	0.938
Complexity to obtain Goods Driving License	0.964	0.952
Unstandardized working hours	0.944	0.925

4.5 Assessment of Structural Model

4.5.1 Multi-Collinearity Analysis

The examination of multi-collinearity was to measure the collinearity issues of the variable with other variables or if they are highly correlated with each other (YILDIRIM, 2024). Kock (2017) proposed a threshold value of 3.33, indicating that

if the collinearity value exceeds this threshold, it suggests the presence of multicollinearity among the variables. The value inflation factor (VIF) for the variables in this study, as shown in Table 4.7, are within an acceptable range, reflecting the measure of collinearity. According to Kline (1998), VIF value below 5.0 are considered acceptable. Therefore, based on the results in Table 4.7, the variables in this study do not exhibit severe multicollinearity.

Table 4.7: Collinearity for Variables

Latent Variable	LP	TDH	ATD	LW	GDL	UWH
Collinearity Value (VIF)	N/A	1.896	3.368	4.960	4.277	2.536

4.5.2 Goodness of Fit for Structural Model

Evaluating the structural model's goodness of fit involves assessing R-squared (R^2), f-squared (f^2), and Q-squared (Q^2). Hair et al. (2022) recommends bootstrapping with 5000 resamples to obtain t-statistics and determine the significance of R^2, f^2, and Q^2 for both structural and measurement models. Bootstrapping enhances the reliability of findings by measuring the accuracy of sample estimates and supporting hypothesis testing. R^2 indicates how well the proposed model explains variable variation and supports hypotheses by reflecting data variability (Harsono et al., 2024), with higher values suggesting a better model fit. f^2 measures the effect size of each direct relationship, while Q^2 evaluates the model's predictive relevance and its alignment with observed data.

4.5.3 Assessment of Predictive Power – R^2

Table 4.8 presents the R-squared value for Logistic performance (LP), which is determined to be 0.424 or 42.4%. This significant percentage of explained variance can be attributed to its predictors, namely Aging truck drivers (ATD), Low wages (LW), Complexity of obtaining Goods Driving License (GDL), Unstandardized working hours (UWH), and Truck driver haulage crisis (TDH). Cohen (1988) guidelines categorize this R-squared value into three levels: large

(0.26), medium (0.13), and small (0.02). Similarly, Truck driver haulage crisis (TDH) were assessed with four independent variables (ATD, LW, GDL and UWH), resulting in an R-squared value of 0.562 or 56.2%. This indicates the highest level of variance explained for employee attitudes (TDH).

Table 4.8: R-squared Value

Hypotheses	Predictors	Dependent Variable	Predictive Power (R^2)
Hypothesis 1	ATD	LP	0.424
Hypothesis 2	LW		
Hypothesis 3	GDL		
Hypothesis 4	UWH		
Hypothesis 9	TDH		

Table 4.9: R-squared Value

Hypotheses	Predictors	Mediating Variable	Predictive Power (R^2)
Hypothesis 5	ATD	TDH	0.562
Hypothesis 6	LW		
Hypothesis 7	GDL		
Hypothesis 8	UWH		

4.5.4 Testing Hypotheses Structural Model

The structural model examined the direct relationships and mediation effects among variables, as shown in Figure 4.3. Aging truck drivers (ATD), Low wages (LW), Complexity in obtaining a Goods Driving License (GDL), and Unstandardized working hours (UWH) were hypothesized to affect Logistics Performance (LP), directly and through the Truck Driver Haulage Crisis (TDH). Results in Table 4.9 revealed significant relationships between ATD and TDH (β=0.255, t=2.845***, p<0.01), GDL and TDH (β=0.234, t=2.099**, p<0.05), and UWH and TDH (β=0.189, t=2.255**, p<0.05), while LW showed a weaker relationship with TDH (β=0.186, t=1.678*, p<0.1). Mediation analysis confirmed that TDH significantly mediated the relationships between ATD (β=0.153, t=2.756***, p<0.01), GDL

(β=0.167, t=2.056**, p<0.01), and UWH (β=0.092, t=1.994**, p<0.01) with LP, while LW (β=0.083, t=1.227) did not demonstrate significant mediation. Overall, hypotheses 1, 2, 3, 4, 5, 6, 8, and 9 were supported, while hypothesis 7 was rejected.

Table 4.10: Summary of the Structural Model

Hypothesis	Path	t-Statistics	Results	Beta
H_1	ATD → TDH	2.845***	Supported	0.255
H_2	LW → TDH	1.678*	Supported	0.186
H_3	GDL → TDH	2.099**	Supported	0.234
H_4	UWH → TDH	2.255**	Supported	0.189
H_5	TDH → LP	7.395***	Supported	0.616
H_6	ATD → TDH → LP	2.756***	Supported	0.153
H_7	LW → TDH → LP	1.227	Not Supported	0.083
H_8	GDL → TDH → LP	2.056**	Supported	0.167
H_9	UWH → TDH → LP	1.994**	Supported	0.092

4.5.5 Assessment of Effect Sizes – f^2

The p-value was utilized in this study to assess the significance of each measured variable. On the other hand, to enhance the confidence level of significance, it is recommended by Sullivan and Feinn (2021) and Bakker et al. (2019) to consider effect size in addition to the p-value. Therefore, this study adopted Cohen (1988) guidelines for effect size, which categorizes it as large (0.35), medium (0.15) and small (0.02). The findings in Table 4.11 indicated that no variable exceeded the threshold for a large effect size (0.35). Only one hypothesis (H_9) achieved a medium effect size (0.15). Additionally, three hypotheses (H_1, H_5 and H_7) demonstrated small effect sizes, exceeding 0,02 but less than 0.15.

However, the findings indicated that the direct relationships described by H2, H3, H4, H6 and H8 had minimal impacts, with effect sizes ranging from 0.004 to 0.019. Consequently, Table 4.11 presents the findings indicating that the hypotheses exhibited different effect sizes in their respective relationships.

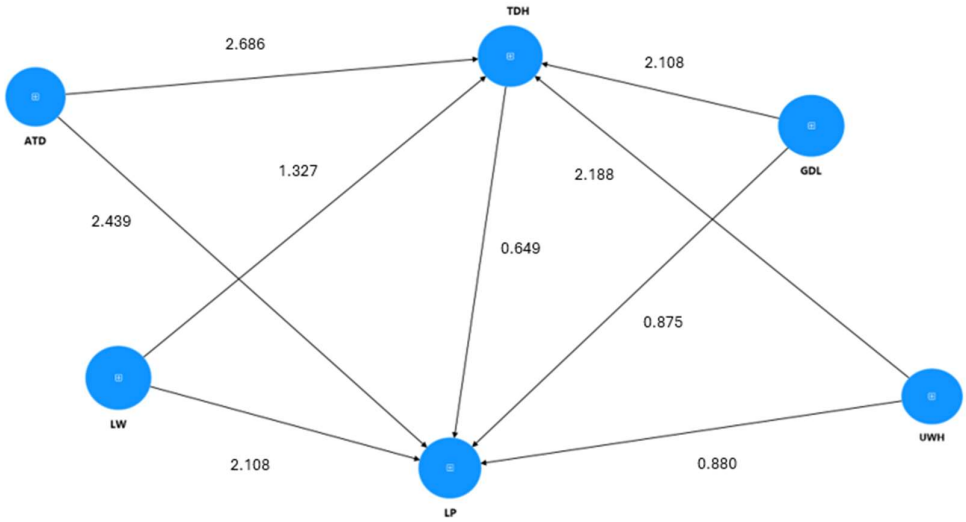


Figure 4.3: Structural Model for Logistic Performance

Table 4.11: Effect Size for Each Hypothesis

Hypotheses	Path	Effect Size (f^2)	Rating
H_1	ATD → LP	0.023	Small
H_2	LW → LP	0.017	Least
H_3	GDL → LP	0.007	Least
H_4	UWH → LP	0.009	Least
H_5	ATD → TDH	0.036	Small
H_6	LW → TDH	0.013	Least
H_7	GDL → TDH	0.026	Small
H_8	UWH → TDH	0.017	Least
H_9	TDH → LP	0.328	Medium

4.5.6 Assessment of Predictive Relevant – Q^2

Predictive relevance (Q^2) evaluates a model's goodness of fit alongside R-squared. While R-squared assesses predictive accuracy, Q-squared measures the relevance of the variables in the model. It is also known as Stone-Geisser values (Geisser, 1975; Stone, 1974) and can be obtained through blindfolding in SmartPLS. Q-squared is calculated using two techniques: cross-validated redundancy and cross-validated communality. Most researchers recommend using cross-validated redundancy (Hair et al., 2022), which was followed in this study. The cross-validated redundancy technique involves key items from the path and structural models to predict excluded data points. For predictive relevance, three value categories are used: large (0.35), medium (0.15), and small (0.02). The Q-squared values in this study ranged from 0.15 to 0.35, falling within the medium category, indicating that the independent variables effectively explain and fit the dependent variable.

Table 4.12: Predictive Relevance Result

Hypotheses	Predictors	Variable	Predictive (Q^2)	Relevance
Hypothesis 1	ATD	LP	0.289	
Hypothesis 2	LW			
Hypothesis 3	GDL			
Hypothesis 4	UWH			
Hypothesis 9	TDH			
Hypothesis 5	ATD	TDH	0.320	
Hypothesis 6	LW			
Hypothesis 7	GDL			
Hypothesis 8	UWH			

4.6 Conclusion

This chapter presents the findings of the collected data, consisting of 200 useable responses for analysis. The data was initially transferred to an Excel file

during the coding process. Descriptive analysis examined respondents' characteristics and backgrounds such as age, gender and education level. The measurement model was then constructed and evaluated, assessing the validity and reliability of the study's measurements as well as the normality of the dataset. Furthermore, the structural model was assessed to investigate the hypothesized relationships outlined in the study. The results include measures of predictive power (R^2), effect size (f^2), and predictive relevance (Q^2). The following chapter will cover the study's discussion, limitations and implications.

CHAPTER 5 : DISCUSSION

5.1 Introduction

This chapter focused on the important discussion that followed the study of the results in Chapter 4. The theories presented in Chapter 1 were then confirmed in more detail in this chapter. Finally, the study's implications, recognised error, and suggestions for additional research are presented.

5.2 Discussion of Major Findings

Given the influence of truck driver shortages on logistics performance, particularly in the Malaysia logistics sector, understanding how these numerous variables lead to shortages of truck drivers is important. This study explores how low wages, complexity in obtaining the GDL license, unstandardized working hours, and aging truck drivers affect logistics performance through the mediating role of the truck driver shortages.

1. **Does the influence aging truck drivers, low wages, complexity to obtain GDL, and unstandardized working hours impact on truck driver haulage crisis ?**

5.2.1 Aging truck drivers

The hypothesis structure model in Chapter 4 for aging truck drivers indicates a significant and positive relationship. This suggests that aging truck drivers significantly influences the impact on truck driver haulage crisis. According to the findings, which are in line with Abdullah and Dawal (2020), older truck drivers are getting closer to retirement, and younger drivers are not keeping up with the

demand, making the growing average age of truck drivers a significant obstacle to sustaining logistical performance. As mentioned by Wang et al. (2022) and Staats et al. (2017), this has resulted in operational inefficiencies and increased expenses, which is consistent with the study's findings.

The discussion demonstrated that truck driver factors that influence truck drivers' haulage crisis on logistics performance are positively influenced with aging truck drivers. As a result, the hypothesis (H1) is proven, and the research question (RQ1) is addressed.

5.2.2 Low wages

The hypothesis structure model in Chapter 4 for low wages indicates a significant and positive relationship. This suggests that low wages significantly influences the impact on truck driver haulage crisis. Hege et al. (2019) have pointed out that despite the hard nature of their labor, truck drivers' low pay has been a major deterrent for prospective drivers, especially those who are younger. The results of this study also support the conclusions of Conroy et al. (2022), who pointed out that low salaries have a detrimental influence on the efficiency of the industry by substantially increasing turnover rates, drivers shortages, and a reduction in logistics performance.

The discussion demonstrated that factors that influence truck drivers' haulage crisis on logistics performance are positively influenced with low wages. As a result, the hypothesis (H2) is proven and the research question (RQ1) is addressed.

5.2.3 Complexity to obtain Goods Driver's License (GDL)

The hypothesis structure model in Chapter 4 for complexity to obtain Goods Driver's License (GDL) indicates a significant and positive relationship. This suggests that complexity to obtain Goods Driver's License (GDL) significantly influences the impact on truck driver haulage crisis. Rahmata et al. (2021) have

observed that the severe conditions and high costs linked to acquiring a GDL discourage prospective drivers from entering the market, increasing the driver shortage and adversely affecting logistics performance. This also supports the findings of Rahmata et al. (2021) and Manrique Vega (2024), who emphasized that although upholding strict regulations and safety is crucial, the convoluted GDL procedure unintentionally restricts the expansion of the trucking sector and raises operating expenses and decreases productivity.

The discussion demonstrated that factors that influence truck drivers' haulage crisis on logistics performance are positively influenced with complexity to obtain GDL. As a result, the hypothesis (H3) is proven and the research question (RQ1) is addressed.

5.2.4 Unstandardized working hours

The hypothesis structure model in Chapter 4 for unstandardized working hours indicates a significant and positive relationship. This suggests that unstandardized working hours significantly influences the impact on truck driver haulage crisis. According to Reyna et al. (2024), irregular and long work hours lead to stress and burnout, which raise turnover rates and discourage people from staying in the field. This result aligns with the findings of Hinder and Arackal (2023), who highlight how the erratic nature of the work disturbs work-life balance and lowers drivers' motivation and output. Furthermore, Okazaki et al. (2019) provides evidence to suggest that irregular work schedules are a major cause of inefficiencies and delays, which in turn compromise logistics performance.

The discussion demonstrated that factors that influence truck drivers' haulage crisis on logistics performance are positively influenced with unstandardized working hours. As a result, the hypothesis (H4) is proven and the research question (RQ1) is addressed.

2. **Does truck driver haulages crisis mediates the relationship between aging truck drivers, low wages, complexity to obtain GDL, and unstandardized working hours and logistics performance in Malaysia?**

5.2.5 Aging truck drivers

The hypothesis structure model in Chapter 4 for aging truck drivers and logistics performance in Malaysia indicate a significant and positive relationship. This suggests that the truck driver haulage crisis significantly mediates the impact of truck driver factors on logistics performance in Malaysia. According to Ji-Hyland & Allen (2022), it states that a poor quality driver will affect the company productivity. Hamido et al, (2021) pointed out that accident rate increased on older truck drivers when the driving range is longer than 400 km. The drivers may feel fatigue and drowsy due to the lack of rest from continuous driving.

The discussion demonstrate that the truck driver haulage crisis mediate the relationship between truck driver factors and logistics performance are positively influenced with aging truck drivers. As a result, the hypothesis (H5) is proven and the research question (RQ2) is addressed.

5.2.6 Low wages

The hypothesis structure model in Chapter 4 for low wages and logistics performance in Malaysia indicates an insignificant and negative relationship. This suggests that the truck driver haulage crisis does not significantly mediate the impact of low wages on logistics performance in Malaysia. According to Wygal et al. (2021), low wages lead to dissatisfaction among truck drivers, which can decrease their job performance. Similarly, Ayodele et al. (2020) found that low wages contribute to high turnover rates, but these factors alone do not significantly affect overall logistics performance when mediated by the truck driver haulage crisis.

The discussion demonstrates that while the truck driver haulage crisis mediates the relationship between truck driver factors and logistics performance, the effect of low wages is negatively associated with logistics performance, yet insignificant. Therefore, the hypothesis (H6) is not supported, and the research question (RQ2) is rejected, as the mediation does not significantly impact logistics performance.

5.2.7 Complexity to obtain Good's Driving License (GDL)

The hypothesis structure in Chapter 4 for complexity to obtain GDL and logistics performance in Malaysia indicate a significant and positive relationship. This suggests that the truck driver haulage crisis is significantly mediate the impact of complaxity to cbtain GDL on logistics performance in Malaysia. The finding from Nasir (2021), describe that there is a requirement of having a good health standard and requirement to attend expensive practical training courses to obtain GDL. This conclusion is aligned with Rahmata et al (2021) which pointed out that health standard had become obtacles and not encouraging the truck drivers to obtain GDL.

The discussion demonstrate that the truck driver haulage crisis mediate the relationship between truck driver factors and logistics performance are positively influenced with complexity to obtain GDL. As a result, the hypothesis (H7) is proven and the research question (RQ2) is addressed.

5.2.8 Unstandardized working hours

The hypothesis structure in Chapter 4 for unstandardized working hours and logistics performance in Malaysia indicate a significant and positive relationship. This suggests that the truck driver haulage crisis is significantly mediating the impact of unstandardized working hours on logistics performance in Malaysia. Based on Hasan et al (2022), the result shows that work stress are significant influence with work fatigue. These stress would come from working overtime and working shifts. Research from Shabadin et al, (2022), also conclude that most of the heavy vehicle drivers are likely to feel fatigue. This is due to the heavy vehicle

drivers' lack of rest breaks and long driving hours. This result is supported by Mahajan, K. (2019), where it concluded that the shorter the sleeping duration, the higher the risk of truck drivers having drowsy driving.

The discussion demonstrate that the truck driver haulage crisis mediate the relationship between truck driver factors and logistics performance are positively influenced with unstandardized working hours. As a result, the hypothesis (H8) is proven and the research question (RQ2) is addressed.

3. **What is the impact of truck driver haulage crisis to logistics performance in Malaysia.**

5.2.9 Truck driver haulage crisis

The hypothesis structure in Chapter 4 for truck driver haulage crisis indicate a significant and positive relationship. This suggests that the truck driver haulage crisis is significantly impact the logistics performance in Malaysia. According to the research from Wang et al (2022), the result shows that truck driver have negative impact on logistics performance. Hence, it indicated that truck driver haulage crisis act as a mediator that influence the logistics performance. This result is supported by Loheswar, Malay Mail (2024) , where it stated that there are truck driver shortages happen in Port Klang, Selangor. It highligthed that the truck driver shortages had impact local construction.It also pointed out that the factors that lead to truck driver haulage crisis are long working hours, low wages, the remaining truck driver demographic are around 50 to 60 years old.

The discussion demonstrate that the relationship between truck driver haulage crisis and logistics performance in Malaysia are positively influenced. As a result, the hypothesis (H9) is proven and the research question (RQ3) is addressed.

5.3 Implications of the study

5.3.1 Practical Implications

Malaysia logistics services' significance in the economy revolves on the promotion of trade, hence the growth of industries and an increase in the competitiveness of Malaysia as a prime trading nation (Nguyen, 2021). However, several challenges that mainly impact the trucking industry which is the main sub-sector of the logistics industry has placed a lot of pressure on the sector's performance. Therefore enhancing the logistics performance of Malaysia will enhance effective workforce management, better perception of policies and create optimal logistics in organizational processes (Amin & Shahwan, 2020). Pursuant to the above considerations, this research helps in explaining how the haulage crisis influences logistics performance. It highlights how organizations can develop good policies to attract and retain the drivers. Additionally, it explores the potential for technological solution to address these challenges and enhance the performance of the supply chain (Ji-Hyland & Allen, 2022). With all the above insights in place, a policy maker can formulate and implement policies just in relation to welfare of drivers and availability of workforce to serve the transport sector (Ahuchogu et al., 2024) and, on its part business can avoid risks by having more than one means of transport available and prepare for any future outcome. Further, the research encourages more engagement with drivers through implementing friendly policies about the drivers and which in turn seeing high satisfaction among the drivers mostly in terms of reduced turnover incidence leading to an effective supply chain (Aryal et al., 2023; Mumford, 2019).

5.3.2 Theoretical Implications

Based on the findings of this research, the theoretical implications highlight the applicability of Job Demand-Resources (JD-R) Theory (Demerouti et al, 2001) and the Equity Theory (Adams, 1963) in understanding the truck driver haulage crisis in Malaysia's logistics industry. Although prior research has applied these theories to analyze job performance and motivation in the current research, these

frameworks are used to establish new findings about the effect of perceived compensation injustice, low wage rates, and tough working conditions on the motivation and turnover of logistics' truck drivers. This research argues that although job resources, including the autonomy mechanism with appointments provides a measure of reduce high workloads, they are however unable to fully eliminate the negative outcomes of high job demands and inequity (Tummers & Bakker, 2021).

Also, the study supplemented by a literature review offers credibility and actual interpretation of the findings with reference to the prior research of the logistics workforce. Low wages, complexity in obtaining a GDL, and unstandardized working hours in the trucking industry are established as relevant causes of the haulage crisis. Consequently, the theory states that the perceived fairness influences the performance in the logistics industry (ODETOLA, 2023). These results suggest that the trucking industry cannot expect to achieve higher levels of job satisfaction, motivation and retention through resource allocations alone, but the system has to deal with issues of fairness and working conditions to enhance the overall logistics performance. As such, extending and enriching these theories is the contribution of this study, as it presents a more clearer understanding about how crisis conditions in certain industries influence job performance.

5.4 Limitations of the study

Firstly, there is almost no prior academic work that explores the haulage crisis among the truck drivers and the effects on the overall logistics productivity of the Malaysian context. Such is the absence of prior research, it becomes challenging to establish a large database to provide firm bench-mark figures to determine the impact of the haulage crisis on logistics performance. Hence, there is a lack of base research work to determine the actual size of the problem correctly.

Secondly, the geographical coverage of the study also has some drawbacks. The significance of the study indicates that the findings of the study will be restricted to major ports in Malaysia which include Selangor, Penang and Johor.

This geographic limitation may further affect the generalization of the results to other parts of Malaysia included in our study since the result cannot be generalized to other ports or logistics centers outside our chosen locations.

Finally, the data collection method in this study has some limitations. This present research makes use of surveys which were administered through Google Forms only. Using online surveys is generally easy, but it can also be misleading as some clients might understate their experiences or take time before they complete their survey with complete seriousness. Besides, the reliance of this study on quantitative data only does not capture much about the forces behind the truck driver haulage situation. It would have been useful to have the combination of a qualitative and a quantitative study.

5.5 Recommendation for future study

Future research on the key drivers of logistics performance especially in relation to the truck driver haulage crisis could be enriched by analysis of the global experience and best practice (Hohenstein, 2022). It may be useful to describe how such problems were solved in other countries with similar conditions and get new ideas for a local experience. However, limiting the network focus to a specific area, for instance major logistics industry of Malaysia, would increase data credibility (Sen et al., 2020). This means that the precision of the results can be achieved, such as Port Klang, Selangor holds crucial importance for Malaysia's logistics industry. There is also a need for future studies to incorporate both the qualitative questionnaire survey to the executives in the transport sector and the quantitative survey questionnaires to the truck drivers and logistics firms (Dawadi et al., 2021). This could give a broader picture of the crisis, trends and their sources as well not only in terms of numbers but in concepts as well (Creswell, 2021).

REFERENCES

Abdullah, N. H., & Dawal, S. Z. M. (2020). Significant Driving Behaviour Pattern Of Ageing Malaysian Automobile Drivers.

Abubakar, M. S., Rahim, N. A., Yusof, R. N. R., & Yahya, M. H. H. (2024). STRATEGIC ORIENTATION INFLUENCE ON SMEs EXPORT PERFORMANCE IN NIGERIA: MEASUREMENT VALIDATION AND PRELIMINARY ANALYSIS. *Journal of International Studies*, *20*(2), 149-190.

Acciaro, M., Renken, K., & El Khadiri, N. (2020). Technological change and logistics development in European ports. *European Port Cities in Transition: Moving Towards More Sustainable Sea Transport Hubs*, 73-88.

Adams, J. S. (1963). Towards an understanding of inequity. The journal of abnormal and social psychology, 67(5), 422.

Adeoye, M. A. (2023). Review of sampling techniques for education. *ASEAN Journal for Science Education*, *2*(2), 87-94.

Ahuchogu, M. C., Sanyaolu, T. O., & Adeleke, A. G. (2024). Workforce development in the transport sector amidst environmental change: A conceptual review. Global Journal of Research in Science and Technology, 2(01), 061-077.

Alger, S. (2019). Licence to drive: the importance of reliability for the validity of the Swedish driving licence test (Doctoral dissertation, Department of applied educational science, Educational measurement, Umeå university).

Amin, H. M., & Shahwan, T. M. (2020). Logistics management requirements and logistics performance efficiency: the role of logistics management practices-evidence from Egypt. International Journal of Logistics Systems and Management, 35(1), 1-27.

Ang, B. H., Chen, W. S., & Lee, S. W. (2019). The Malay Manchester Driver Behaviour Questionnaire: A cross-sectional study of geriatric population in Malaysia. *Journal of Transport & Health*, *14*, 100573.

Anyona, J. O. (2019). *Inventory management practices and supply chain performance of antiretroviral medicinesin public hospitals in Nyamira county, Kenya* (Doctoral dissertation, University of Rwanda)

Aryal, A., Janssen, B., Casteel, C., Fethke, N. B., Buikema, B., Cho, H., & Rohlman, D. S. (2023). Applying the Worker Well-Being Framework to Identify Factors that Impact Turnover Among Long-Haul Truck Drivers. Workplace health & safety, 71(9), 419-428.

Bagozzi, R. P., Yi, Y. and Phillips, L. W. (1991), "Assessing construct validity in organizational research", Administrative science quarterly, pp. 421-458.

Bakker, A. B., & de Vries, J. D. (2021). Job Demands–Resources theory and self-regulation: New explanations and remedies for job burnout. *Anxiety, stress, & coping*, *34*(1), 1-21.

Bakker, A. B., & Demerouti, E. (2007). The job demands-resources model: State of the art. *Journal of managerial psychology*, *22*(3), 309-328.

Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of occupational health psychology*, *22*(3), 273.

Bakker, A. B., Demerouti, E., & Euwema, M. C. (2005). Job resources buffer the impact of job demands on burnout. *Journal of occupational health psychology*, *10*(2), 170.

Bakker, A., Cai, J., English, L., Kaiser, G., Mesa, V., & Van Dooren, W. (2019). Beyond small, medium, or large: Points of consideration when interpreting effect sizes. *Educational studies in mathematics*, *102*, 1-8.

Beckers, D. G., Van der Linden, D., Smulders, P. G., Kompier, M. A., Taris, T. W., & Geurts, S. A. (2008). Voluntary or involuntary? Control over overtime and rewards for overtime in relation to fatigue and work satisfaction. *Work & Stress*, *22*(1), 33-50.

Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., & Wang, L. C. (2024). Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best-practice recommendations. *Asia Pacific Journal of Management*, *41*(2), 745-783.

Chilala, M. (2022). *Developing interventions for truck drivers retention at Vicmo transport* (Doctoral dissertation, The University of Zambia).

Chua, S. (2024, June 15). *Punish drivers of heavy vehicles who exceed hour limits, says Miros*. Free Malaysia Today | FMT. https://www.freemalaysiatoday.com/category/nation/2024/06/15/punish-drivers-of-heavy-vehicles-who-exceed-hour-limits-says-miros/

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Conroy, S. A., Roumpi, D., Delery, J. E., & Gupta, N. (2022). Pay volatility and employee turnover in the trucking industry. *Journal of Management*, *48*(3), 605-629.

Coursera, 2022. What is data analysis? (With examples). [online] Available at: [Accessed 13 August 2022].

Creswell, J. W. (2021). A concise introduction to mixed methods research. SAGE publications.

Dash, G., & Paul, J. (2021). CB-SEM vs PLS-SEM methods for research in social sciences and technology forecasting. *Technological Forecasting and Social Change*, *173*, 121092.

Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-methods research: A discussion on its types, challenges, and criticisms. Journal of Practical Studies in Education, 2(2), 25-36.

de Winter, J., Driessen, T., Dodou, D., & Cannoo, A. (2024). Exploring the challenges faced by Dutch truck drivers in the era of technological advancement. Frontiers in public health, 12, 1352979.

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied psychology*, *86*(3), 499.

Deshpande, B. H. A. G. Y. A. S. H. R. E. E., & Girme, A. N. U. R. A. D. H. A. (2019). Sampling techniques. *Advances and Applications in Mathematical Sciences*, *18*(10), 1055-1062.

Dirgiatmo, Y. (2023). Testing The Discriminant Validity and Heterotrait–Monotrait Ratio of Correlation (HTMT): A Case in Indonesian SMEs. In *Macroeconomic Risk and Growth in the Southeast Asian Countries: Insight from Indonesia* (pp. 157-170). Emerald Publishing Limited.

Doktoralina, C., & Apollo, A. (2019). The contribution of strategic management accounting in supply chain outcomes and logistic firm profitability. *Uncertain Supply Chain Management*, *7*(2), 145-156.

Duckering, E. (2022). Strategies to Overcome the Truck Driver Shortage in the United States (Doctoral dissertation, Walden University).

Duggal, N. (2023, July 24). What Is Data Processing: Cycle, Types, Methods, Steps And Examples. Simplilearn. https://www.simplilearn.com/what-is-data-processing-article#what_is_data_processing

Fabrigar, L. R., & Petty, R. E. (1999). The role of the affective and cognitive bases of attitudes in susceptibility to affectively and cognitively based persuasion. *Personality and Social Psychology Bulletin, 25*, 363–381.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior research methods*, *41*(4), 1149-1160.

Folger, R., & Konovsky, M. A. (1989). Effects of procedural and distributive justice on reactions to pay raise decisions. *Academy of Management journal*, *32*(1), 115-130.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18, 39–50.

Freeman, A. B. (2019). *Exploring how managers increase employee performance within organizational supply chains*. Walden University.

Geisser, S. (1975). A predictive approach to the random effect model. Biometrika, 61(1), 101–107.

Guetterman, T. C. (2019). Basics of statistics for primary care research. *Family medicine and community health*, *7*(2).

Gurtu, A. (2023). Truck transport industry in the USA: Challenges and likely disruptions. *International Journal of Logistics Systems and Management*, *44*(1), 46-58.

Habidin, N., Zubir, A., Fuzi, N.L., Azrin, N., and Azman, M.N.A., 2015. Sustainable performance measures for Malaysian automotive industry. World Applied Sciences Journal, 33(6), pp.1017-1024.

Hair Jr, J. F., Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of business research*, *109*, 101-110

Hair, J., & Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. *Research Methods in Applied Linguistics*, *1*(3), 100027.

Hamido, S., Hamamoto, R., Gu, X., & Itoh, K. (2021). Factors influencing occupational truck driver safety in ageing society. *Accident Analysis & Prevention*, *150*, 105922.

Harsono, I., Fadliyanti, L., Mulawiani, B. S. W., Usman, A., & Abubakar, A. (2024). Analysis of Plant Productivity, Farmer Income and Availability of Supporting Infrastructure on Soybean Agribusiness Institutional Performance in East Java. *West Science Agro*, *2*(01), 35-43.

Hasan, N. A. C., Karuppiah, K., Hamzah, N. A., Juzad, K. M., & Tamrin, S. B. M. (2022). PREVALENCE OF DRIVING FATIGUE AND ITS ASSOCIATED FACTORS AMONG LOGISTIC TRUCK DRIVERS IN MALAYSIA. *Malaysian Journal of Public Health Medicine*, *22*(3), 331-341.

Heeren, E. L. (2023). *Tech Talent and US Competition Policy: An Analysis of Big Tech Hiring Practices in the Virtual Reality Sector* (Master's thesis, Georgetown University).

Hege, A., Lemke, M. K., Apostolopoulos, Y., & Sönmez, S. (2019). The impact of work organization, job stress, and sleep on the health behaviors and outcomes of US long-haul truck drivers. *Health Education & Behavior*, *46*(4), 626-636.

Henseler, J., & Schuberth, F. (2020). Using confirmatory composite analysis to assess emergent variables in business research. Journal of Business Research, 120, 147–156. https://doi.org/10.1016/j.jbusres.2020.07 .026

Hinder, J., & Arackal, B. J. (2023). Honk If You Love A Good Work Environment! A Study On The Work Environment Of European Truck Drivers.

Hohenstein, N. O. (2022). Supply chain risk management in the COVID-19 pandemic: strategies and empirical lessons for improving global logistics service providers' performance. The International Journal of Logistics Management, 33(4), 1336-1365.

Hossan, D., Mansor, Z., Jaharuddin, N., & Jantan, A. (2022). Transformation of Job Demands-Resources Model to Job Demands-Resources Theory. do intext citation

Hu, S. R., & Chen, S. Y. (2019). Effects of mixed traffic and elderly passengers on city bus drivers' work-related fatigue. Transportation research part F: traffic psychology and behaviour, 66, 485-500.

Huma, S., Javaid, T., & Ishtiaque, S. (2021). Factors affecting turnover intention of logisticians: empirical evidence from Pakistan. Journal for Global Business Advancement, 14(4), 568-586.

Janssen, P. P., Peeters, M. C., de Jonge, J., Houkes, I., & Tummers, G. E. (2004). Specific relationships between job demands, job resources and psychological outcomes and the mediating role of negative work–home interference. *Journal of vocational behavior*, *65*(3), 411-429.

Ji-Hyland, C., & Allen, D. (2022). What do professional drivers think about their profession? An examination of factors contributing to the driver shortage. *International Journal of Logistics Research and Applications*, *25*(3), 231-246.

Johanson, G. A., & Brooks, G. P. (2010). Initial scale development: sample size for pilot studies. *Educational and psychological measurement*, *70*(3), 394-400.

Johnson, D., 2022. What is data analysis? Research, types and, example. [online] Available at: [Accessed 13 August 2022].

Jordan, P. J., & Troth, A. C. (2020). Common method bias in applied settings: The dilemma of researching in organizations. *Australian Journal of management*, *45*(1), 3-14.

Karunarathna, I., Gunasena, P., Hapuarachchi, T., & Gunathilake, S. (2024). The crucial role of data collection in research: Techniques, challenges, and best practices. Uva Clinical Research, 1-24.

Khan, S. A. R. (2019). The nexus between carbon emissions, poverty, economic growth, and logistics operations-empirical evidence from southeast Asian countries. Environmental Science and Pollution Research, 26(13), 13210-13220.

Kline, R. B. (2023). *Principles and practice of structural equation modeling*. Guilford publications.

Kock, N. (2017). Common Method Bias: A Full Collinearity Assessment Method for PLSSEM. In H. Latan & R. Noonan (Eds.), Partial Least Squares Path Modeling: Basic Concepts, Methodological Issues and Applications (pp. 245-257). Springer International Publishing.

Kudo, T., & Belzer, M. H. (2019). Safe rates and unpaid labour: non-driving pay and truck driver work hours. *The Economic and Labour Relations Review*, *30*(4), 532-548.

Lai, X., Zhu, H., Du, H., Wang, J., Bo, L., & Huo, X. (2021). Reliability and validity of the Chinese mandarin version of the swallowing quality of life questionnaire. *Dysphagia*, *36*, 670-679.

LeMay, S., & Keller, S. B. (2019). Fifty years inside the minds of truck drivers. *International Journal of Physical Distribution & Logistics Management*, *49*(6), 626-643.

Leong Weng, L. (2019). Organizational justice and employee deviance among emergency services personnel in Malaysia. Journal of Contemporary Research in Business, Economics and Finance, 1(4), 62-73.

Ling, L., Lai, S.H., Yusop, Z., Chin, R.J., and Ling, J.L., 2022. Formulation of parsimonious urban flash flood predictive model with inferential statistics. Mathematics, 10(2), pp.175.

Loheswar, R. (2024, January 22). ECRL entices 40pc truck drivers, leaving Klang Valley in the lurch. *Malay Mail.* https://www.malaymail.com/news/malaysia/2024/01/22/ecrl-entices-40pc-truck-drivers-leaving-klang-valley-in-the-lurch/113193

Lookman, K., Pujawan, N., & Nadlifatin, R. (2023). Innovative capabilities and competitive advantage in the era of industry 4.0: A study of trucking industry. *Research in Transportation Business & Management*, *47*, 100947.

Mahajan, K., Velaga, N. R., Kumar, A., Choudhary, A., & Choudhary, P. (2019). Effects of driver work-rest patterns, lifestyle and payment incentives on long-haul truck driver sleepiness. *Transportation research part F: traffic psychology and behaviour*, *60*, 366-382.

Manrique Vega, M. K. (2024). Manual for the legal requirements for Mexican Carriers to transport reefer and dry loads to the United States of America.

Mazhar, S.A., Anjum, R., Anwar, A.I. and Khan, A.A., 2021. Methods of data collection: A fundamental tool of research. Journal of Integrated Community Health (ISSN 2319-9113), 10(1), pp.6-10.

McCombes, S. (2022). Descriptive Research | Definition, Types, Methods & Examples. Scribbr. https://www.scribbr.com/methodology/descriptive-research/

Memon, M. A., Salleh, R., Mirza, M. Z., Cheah, J. H., Ting, H., & Ahmad, M. S. (2020). Performance appraisal satisfaction and turnover intention: The mediating role of work engagement. *Management decision*, *58*(6), 1053-1066.

Meng, L. C., & Ahmad, W. N. K. W. (2024). The Relationship Between Internal Factors and Logistics Performance of Logistics Companies in Selangor, Malaysia. *Research in Management of Technology and Business*, *5*(1), 268-282.

MENGESHA, F. (2020). *ASSESMENT OF FACTORS ON LOGISTICS PRACTICE PERFORMANCE: THE CASE OF SOME SELECTED LOGISTICS SERVICE PROVIDERS'* (Doctoral dissertation, ST. MARY'S UNIVERSITY).

Mok Kim Man, M., & Yie Yeen, L. (2021). Factors affecting the effectiveness of employees' performance appraisal in private hospitals in Malaysia. International Journal of Business and Society, 22(1), 257-275.

Moons, K., Waeyenbergh, G., & Pintelon, L. (2019). Measuring the logistics performance of internal hospital supply chains–a literature study. *Omega*, *82*, 205-217.

Mumford, A. P. (2019). Assessing the Relationship Between Job Satisfaction and Truck Driver Turnover Intention (Doctoral dissertation, Capella University).

Naganawa, H., Hirata, E., Firdausiyah, N., & Thompson, R. G. (2024). Logistics Hub and Route Optimization in the Physical Internet Paradigm. *Logistics*, *8*(2), 37.

Newnam, S., Koppel, S., Molnar, L. J., Zakrajsek, J. S., Eby, D. W., & Blower, D. (2020). Older truck drivers: How can we keep them in the workforce for as long as safely possible?. *Safety science*, *121*, 589-593.

Nguyen, H. (2021). The role of logistics industry in the sustainable economic development of Southeast Asian countries. Accounting, 7(7), 1681-1688.

Nguyen, M. H., Pojani, D., Nguyen-Phuoc, D. Q., & Thi, B. N. (2023). What if delivery riders quit? Challenges to last-mile logistics during the Covid-19

pandemic. *Research in Transportation Business & Management*, *47*, 100941.

Nunnally, J. C. (1975). Psychometric theory—25 years ago and now. *Educational Researcher*, *4*(10), 7-21.

ODETOLA, F. T. (2023). *IMPACT OF ORGANISATIONAL JUSTICE ON EMPLOYEES'BURNOUT AND WORKPLACE CYNICISM IN DHL INTERNATIONAL LTD IN SOUTH-WEST, NIGERIA* (Doctoral dissertation, OSUN STATE UNIVERSITY OSOGBO).

Okazaki, E., Nishi, D., Susukida, R., Inoue, A., Shimazu, A., & Tsutsumi, A. (2019). Association between working hours, work engagement, and work productivity in employees: A cross-sectional study of the Japanese Study of Health, Occupation, and Psychosocial Factors Relates Equity. *Journal of occupational health*, *61*(2), 182-188.

Paire-Ficout, L., Lafont, S., Hay, M., Coquillat, A., Fabrigoule, C., & Chavoix, C. (2021). Relationships between cognitive and driving self-awareness in older drivers. *The Journals of Gerontology: Series B*, *76*(6), 1077-1085.

Pardoe, I. (2020). *Applied regression modeling*. John Wiley & Sons.

Peters, S. E., Grogan, H., Henderson, G. M., López Gómez, M. A., Martínez Maldonado, M., Silva Sanhueza, I., & Dennerlein, J. T. (2021). Working conditions influencing drivers' safety and well-being in the transportation industry:"on board" program. *International journal of environmental research and public health*, *18*(19), 10173.

Pissuwan, C., & Karnsomdee, P. (2019, March). CONSUMER BEHAVIORAL AND MARKETING MIX FACTORS INFLUENCING ON DECISION MAKING OF BUSINESS LOAN SERVICE SELECTION OF SMALL AND MEDIUM ENTERPRISE IN SAKON NAKHON PROVINCE. In *INTERNATIONAL ACADEMIC MULTIDISCIPLINARY RESEARCH CONFERENCE IN VIENNA 2019*.

Pourrahmani, E., & Jaller, M. (2021). Crowdshipping in last mile deliveries: Operational challenges and research opportunities. *Socio-Economic Planning Sciences*, *78*, 101063.

Prapinit, P., Kafi, A., Osman, N. H. B., & Melan, M. (2024). Navigating COVID-19 Challenges in Malaysian Haulage Industry. International Journal of Sustainable Development & Planning, 19(3).

Rahmata, A. K., bin Yajid, A. A., Ibrahima, I., Nasirb, S., Razakc, A. H. A., & Arofd, A. (2021). A Study on Truck Drivers Shortage in Malaysia.

Rashmi, B. S., & Marisamynathan, S. (2023). Factors affecting truck driver behavior on a road safety context: A critical systematic review of the evidence. *Journal of traffic and transportation engineering (English edition)*.

Reyna, C. A. (2024). A Quantitative Survey Exploring the Types of Internet Accessible Mental Health Resources Recognized by US Long-Haul Truck Drivers.

Reynolds, N., Diamantopoulos, A., & Schlegelmilch, B. (1993). Pre-testing in questionnaire design: a review of the literature and suggestions for further research. *Market Research Society. Journal.*, *35*(2), 1-11.

Ross, J. A. (2019). The reliability, validity, and utility of self-assessment. *Practical Assessment, Research, and Evaluation*, *11*(1), 10.

Sarstedt, M., Richter, N. F., Hauff, S., & Ringle, C. M. (2024). Combined importance–performance map analysis (cIPMA) in partial least squares structural equation modeling (PLS–SEM): a SmartPLS 4 tutorial. *Journal of Marketing Analytics*, 1-15..

Selvanathan, M., Jayabalan, N., Saini, G. K., Supramaniam, M., & Hussin, N. (2020). Employee Productivity In Malaysia Private Higher Educational

Institutions. PalArch's Journal of Archaeology of Egypt / Egyptology, 17(3), 66–79. https://www.researchgate.net/publication/345693737_Employee_Productivity_in_Malaysian_Private_Higher_Educational_Institutions

Sen, S., Shaikh, M. A., Tareq, A. M., Islam, M. S., & Xuefeng, W. (2020). Port efficiency and supply chain: Implication for Bangladesh. International Journal of Engineering and Management Research (IJEMR), 10(6), 21-34.

Shabadin, A., Azman, N. S., Radzi, M. A. M., Abd Ghani, M. R., Hashim, H. H., Ishak, S. Z., & Mohamed, L. (2022). Fatigue among heavy vehicle drivers on expressway. *International journal of road safety*, *3*(1), 17-22.

Sobaih, A. E. E., & Elshaer, I. A. (2022). Personal traits and digital entrepreneurship: a mediation model using SmartPLS data analysis. Mathematics, 10(21), 3926.

Song, M. J., & Lee, H. Y. (2022). The relationship between international trade and logistics performance: A focus on the South Korean industrial sector. *Research in Transportation Business & Management*, *44*, 100786.

Staats, U., Lohaus, D., Christmann, A., & Woitschek, M. (2017). Fighting against a shortage of truck drivers in logistics: Measures that employers can take to promote drivers' work ability and health. *Work*, *58*(3), 383-397.

Stone, M. (1974). Cross-validatory choice and assessment of statistical predictions. *Journal of the Royal Statistical Society*, 36(2), 111-147.

Strom, B. L. (2001). Data validity issues in using claims data. *Pharmacoepidemiology and drug safety*, *10*(5), 389-392.

Sullivan, G. M., & Feinn, R. S. (2021). Facts and fictions about handling multiple comparisons. *Journal of Graduate Medical Education*, *13*(4), 457-460.

Sumbal, M. S., Agha, M. H., Nisar, A., & Chan, F. T. (2024). Logistics performance system and their impact on economic corridors: a developing economy perspective. Industrial Management & Data Systems, 124(3), 1005-1025.

Taherdoost, H. (2021). Data Collection Methods and Tools for Research; A Step-by-Step Guide to Choose Data Collection Technique for Academic and Business Research Projects. International Journal of Academic Research in Management (IJARM). https://hal.science/hal-03741847

Tien, N. H., Anh, D. B. H., & Thuc, T. D. (2019). Global supply chain and logistics management.

Tilahun, M. (2022). Multi-drug resistance profile, prevalence of extended-spectrum beta-lactamase and carbapenemase-producing Gram negative bacilli among admitted patients after surgery with suspected of surgical site nosocomial infection North East Ethiopia. *Infection and Drug Resistance*, 3949-3965.

Trick, S., & Peoples, J. (2021). Employing non-citizens to address truck driver shortages: Is there an impact on domestic driver wages?. Journal of Economics, Race, and Policy, 4, 1-14.

Trick, S., Peoples, J., & Ross, A. (2021). Driver turnover in the trucking industry: What's the cost of reducing driver quit rates?. *Research in transportation economics*, *89*, 101129.

Tummers, L. G., & Bakker, A. B. (2021). Leadership and job demands-resources theory: A systematic review. *Frontiers in psychology*, *12*, 722080.

Urcádiz Cázares, F. J., & Monroy Ceseña, M. A. (2022). Nominal scale as alternative service quality evaluation: Study case of hacienda Bugambilias Hotel, Mexico. *Visión de futuro*, *26*(2), 168-187.

Wang, M., Wood, L. C., & Wang, B. (2022). Transportation capacity shortage influence on logistics performance: evidence from the driver shortage. *Heliyon*, *8*(5).

Weisberg, S. (2005). *Applied linear regression* (Vol. 528). John Wiley & Sons.

Winkelhaus, S., Grosse, E. H., & Glock, C. H. (2022). Job satisfaction: An explorative study on work characteristics changes of employees in Intralogistics 4.0. *Journal of Business Logistics*, *43*(3), 343-367.

Wong, C. Y., & Fung, H. N. (2019). Caught-in or breaking-free from the Middle Income Trap: the case of Malaysia. *Seoul Journal of Economics*, *32*(1).

Xu, H., & Deng, Y. (2017). Dependent evidence combination based on shearman coefficient and pearson coefficient. *Ieee Access*, *6*, 11634-11640.

YILDIRIM, H. (2024). The Multicollinearity Effect on the Performance of Machine Learning Algorithms: Case Examples in Healthcare Modelling. *Journal of Engineering & Smart Systems*, *12*(3).

Zhyhula, S. (2023). Integrated logistics activities management of an engineering company.

APPENDICES

Appendix 3.5.1

Questionnaire

Survey on 'The Factors Influencing Logistic Performance: The Mediating Role of Truck Driver Haulage Crisis'

Dear respondents,

We are students of Bachelor of Business Administration (Honours) Business Administration Logistics and Supply Chain Management from Faculty of Business and Finance (FBF) in Universiti Tunku Abdul Rahman (UTAR). The purpose of this study is to research about the factors influencing the logistics performance: The mediating role of truck driver haulage crisis. This study aims to provide insights into the factors influencing logistics performance, particularly through the lens of the truck driver haulage crisis. Understanding these factors can shed light on industry challenges and help identify areas for improvement to enhance overall logistics efficiency.

There are seven (7) sections in this questionnaire. Section A is on Demographic Profile. Section B is on Aging Truck Drivers , Section C is on Low Wages, Section D is on Complexity of obtain Goods Driving License (GDL), Section E is on Unstandardized Working Hours, Section F is on Truck driver's haulage crisis and Section G is on Logistics Performance. Please read the instructions carefully before answering the questions. Please answer ALL questions in ALL sections. Completion of this questionnaire will take you approximately 5 to 7 minutes.

Your participation in this study is entirely voluntary. There will be no disadvantage if you decide not to complete the attached anonymous questionnaire. You can withdraw at any time without any penalty. You can refuse to answer any question at any time if you feel uncomfortable.

The information collected from you will be kept strictly private and confidential. All responses and findings will be used solely for academic purpose.

Your assistance in completing this questionnaire is very much appreciated. Thank you for your participation. If you have any question regarding to this questionnaire, you may contact us at 2103199@1utar.my.

If you decide to complete this attached anonymous questionnaire, this will be taken as you voluntarily agree and formal consent to participate in this study. Thank you very much for your cooperation and willingness to participate in this study.

Your sincerely,

Marsyall Peter
Emmanuel Joe A/L Stephen Ravi Sankar
Jayden Guee
Yeoh Kai Lun

Section A Demographic Part

Please select one for each of the following:

No.	Items	Indicators	Sources
1	Gender	○ Male ○ Female	Adapted from Tilahun (2022)
2	Age	○ 20 and below ○ 21-30 years old ○ 31-40 years old ○ 41-50 years old ○ 50 and above	Adapted from Ji-Hyland & Allen (2022)
3	Education Level	○ PHD ○ Master's Degree ○ Bachelor's Degree ○ STPM/Diploma/SPM	Adapted from Tilahun (2022)
4	Working experience in trucking company	○ Less than 5 years ○ 5-10 years ○ More than 10 years	Adapted from Ji-Hyland & Allen (2022)
5	Industry	○ Logistics ○ Transport ○ Logistics Service Provider ○ Courier Company	Adapted from Lookman et al. (2023)

Section B: Independent Variables

Level of agreement

1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agree

The following statement indicates the level of Aging truck drivers. The number 1 to 5 reflect a scale with 1 representing strongly disagree and 5 representing strongly agree. Please select the best options that suit your view regarding the statement based on your opinion.

Aging Truck Drivers

No.	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Sources
1	Driving for long hours will give me a headache.	1	2	3	4	5	Adapted from Hu & Chen (2019)
2	I feel my body sore and tense when I am sitting in a fixed position for a long time.	1	2	3	4	5	Adapted from Hu & Chen (2019)

3	When I drive, I get more exhausted than I used to.	1	2	3	4	5	Adapted from Paire-Ficout et al. (2021)
4	I am planning to drive to a certain delivery spot, but all of a sudden, I realise I am travelling to a different place.	1	2	3	4	5	Adapted from Ang et al. (2019)
5	I sometimes have no clear memory of the road that I just used to travel.	1	2	3	4	5	Adapted from Ang et al. (2019)
6	Once I park the truck, I tend to forget to turn off the engine.	1	2	3	4	5	Adapted from Ang et al. (2019)

Section C: Independent Variables

Level of agreement

1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agree

The following statement indicates the level of low wages. The number 1 to 5 reflect a scale with 1 representing strongly disagree and 5 representing strongly agree. Please select the best options that suit your view regarding the statement based on your opinion.

Low Wages

No.	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Sources
1	My present salary is appropriate to the work I do.	1	2	3	4	5	Adapted from Huma et al. (2021)
2	I feel I am satisfactorily paid compared to my colleagues at other 3PL.	1	2	3	4	5	Adapted from Huma et al. (2021)
3	I do get overtime salary.	1	2	3	4	5	Adapted from Chilala (2022)

4	I receive an additional bonus if I do additional work.	1	2	3	4	5	Adapted from Huma et al. (2021)
5	I receive fringe benefits as a truck driver (long day off, sick pay).	1	2	3	4	5	Adapted from Chilala (2022)
6	I can make ends meet with one salary.	1	2	3	4	5	Adapted from de Winter et al. (2024)

Section D: Independent Variables

Level of agreement

1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agree

The following statement indicates the level of Complexity to obtain Goods Driving License (GDL). The number 1 to 5 reflect a scale with 1 representing strongly disagree and 5 representing strongly agree. Please select the best options that suit your view regarding the statement based on your opinion.

Complexity of obtain Goods Driving License (GDL)

No.	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Sources
1.	I find the assessment guide for obtaining a Goods Driving License (GDL) comprehensive and suitable for evaluating the required competencies.	1	2	3	4	5	Adapted from Alger, S. (2019)
2	I believe the Goods Driving License (GDL) assessment guide is applied consistently and adheres to specified guidelines.	1	2	3	4	5	Adapted from Alger, S. (2019)

3	I feel that the observations during the Goods Driving License (GDL) testing procedure accurately reflect the full range of required competencies.	1	2	3	4	5	Adapted from Alger, S. (2019)
4	I think the tasks in the Goods Driving License (GDL) test are designed to accurately assess the competencies needed to safely operate a truck.	1	2	3	4	5	Adapted from Alger, S. (2019)
5	I believe the Goods Driving License (GDL) test is structured to eliminate skill-irrelevant sources of variability that could bias the interpretation of results.	1	2	3	4	5	Adapted from Alger, S. (2019)
6	I feel that passing the Goods Driving License (GDL) test indicates that candidates have the skills necessary to independently and safely operate a truck in most scenarios.	1	2	3	4	5	Adapted from Alger, S. (2019)

Section E: Independent Variables

Level of agreement

1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agree

The following statement indicates the level of Unstandardized working hours. The number 1 to 5 reflect a scale with 1 representing strongly disagree and 5 representing strongly agree. Please select the best options that suit your view regarding the statement based on your opinion.

Unstandardized Working Hours

No.	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Sources
1	The total working hours arranged by our trucking company is reasonable.	1	2	3	4	5	Adapted from Mahajan et al. (2019)
2	The frequency of night work-shift assigned by our trucking company is lower.	1	2	3	4	5	Adapted from Mahajan et al. (2019)
3	The gap between working hours and break time is reasonable.	1	2	3	4	5	Adapted from Mahajan et al. (2019)
4	The rest time per day allocated by our trucking company is sufficient.	1	2	3	4	5	Adapted from Mahajan et al. (2019)
5	Our sleep duration is sufficient and allows us to perform our jobs effectively.	1	2	3	4	5	Adapted from Mahajan et al. (2019)
6	Our non-driving working hours are balanced with the driving task.	1	2	3	4	5	Adapted from Mahajan et al. (2019)

Section F: Mediator

Level of agreement

1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agree

The following statement indicates the level of Truck driver's haulage crisis. The number 1 to 5 reflect a scale with 1 representing strongly disagree and 5 representing strongly agree. Please select the best options that suit your view regarding the statement based on your opinion.

Truck driver's haulage crisis (what are the crisis/ what initiate the crisis)

No.	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Sources

1	I think that the truck driver profession does not get the respect it deserves.	1	2	3	4	5	Adapted from de Winter et al. (2024)
2	I find that the hourly wage provided is not sufficient compared to similar jobs.	1	2	3	4	5	Adapted from de Winter et al. (2024)
3	The ongoing problems with truck driver haulage are the reason I don't intend to drive for this trucking company for very long.	1	2	3	4	5	Adapted from Ji-Hyland & Allen (2022)
4	The job as a truck driver always causes me stress.	1	2	3	4	5	Adapted from Nguyen et al. (2023)
5	I constantly feel worn out after work, because of the hauling expectation placed on truck drivers.	1	2	3	4	5	Adapted from Nguyen et al. (2023)
6	I feel that the work pressure from the job affects my driving behavior.	1	2	3	4	5	Adapted from de Winter et al. (2024)

Section G: Dependent Variable

Level of agreement

1 - Strongly Disagree 2 - Disagree 3 - Neutral 4 - Agree 5 - Strongly Agree

The following statement indicates the level of logistics performance. The number 1 to 5 reflect a scale, with 1 representing strongly disagree and 5 representing strongly agree. Please select the best option that represents your view regarding that statement based on your opinion.

Logistics Performance

No.	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Sources

1	Logistics activities appear in our trucking company; we provide the best of times for the time of goods and services.	1	2	3	4	5	Adapted from Almasratı (2022)
2	Our logistics activities appearing in our trucking company and our staff responsible for this activity are trustworthy.	1	2	3	4	5	Adapted from Almasratı (2022)
3	Logistics activities that appear in our trucking company; allows the execution of flexible operation operations.	1	2	3	4	5	Adapted from Almasratı (2022)
4	Logistics activities that appear in our trucking company; the goods and services offered are made in a timely manner.	1	2	3	4	5	Adapted from Almasratı (2022)
5	Logistics activities that appear in our trucking company; reduce time problems in delivery and purchase.	1	2	3	4	5	Adapted from Almasratı (2022)
6	Logistics activities appearing in our trucking company increase the dominant	1	2	3	4	5	Adapted from Almasratı (2022)

	flexibility in production.						

3.5.4 Pilot study

Reliability

Scale: ATD

Case Processing Summary

		N	%
Cases	Valid	30	13.0
	Excluded[a]	200	87.0
	Total	230	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.821	.831	6

Reliability

Scale: LW

Case Processing Summary

		N	%
Cases	Valid	30	13.0
	Excluded[a]	200	87.0
	Total	230	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.925	.924	6

Reliability

Scale: GDL

Case Processing Summary

		N	%
Cases	Valid	30	13.0
	Excluded[a]	200	87.0
	Total	230	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.960	.962	6

Reliability

Scale: UWH

Case Processing Summary

		N	%
Cases	Valid	30	13.0
	Excluded[a]	200	87.0
	Total	230	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.923	.924	6

Reliability

Scale: TDH

Case Processing Summary

		N	%
Cases	Valid	30	13.0
	Excluded[a]	200	87.0
	Total	230	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.794	.800	6

Reliability

Scale: LP

Case Processing Summary

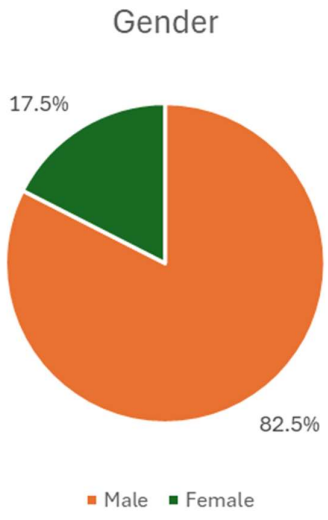
		N	%
Cases	Valid	30	13.0
	Excluded[a]	200	87.0
	Total	230	100.0

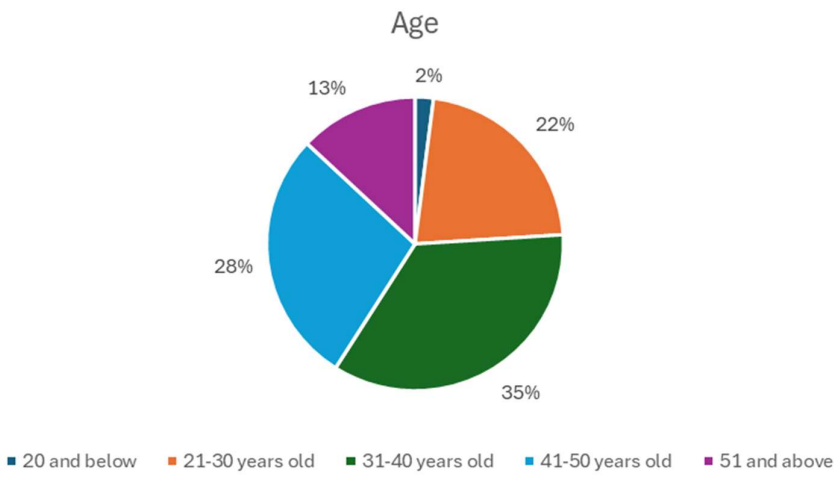
a. Listwise deletion based on all variables in the procedure.

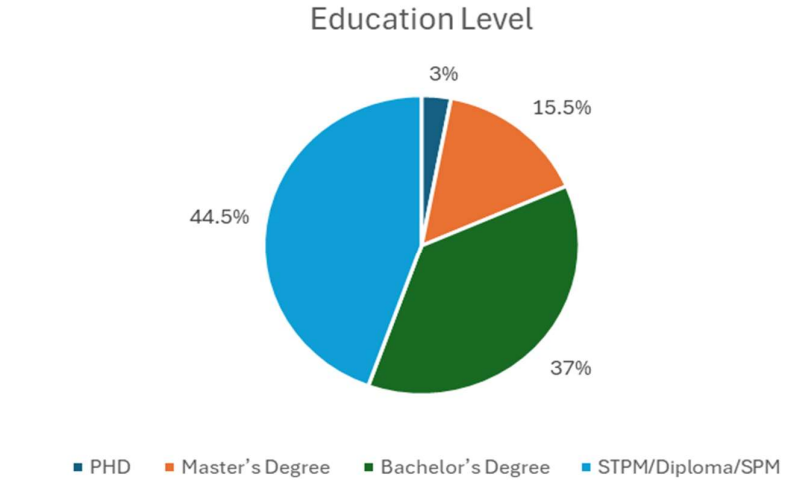
Reliability Statistics

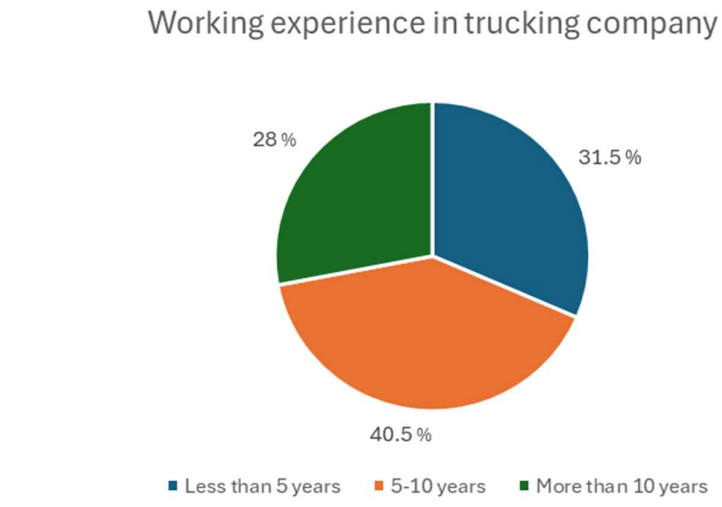
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.962	.965	6

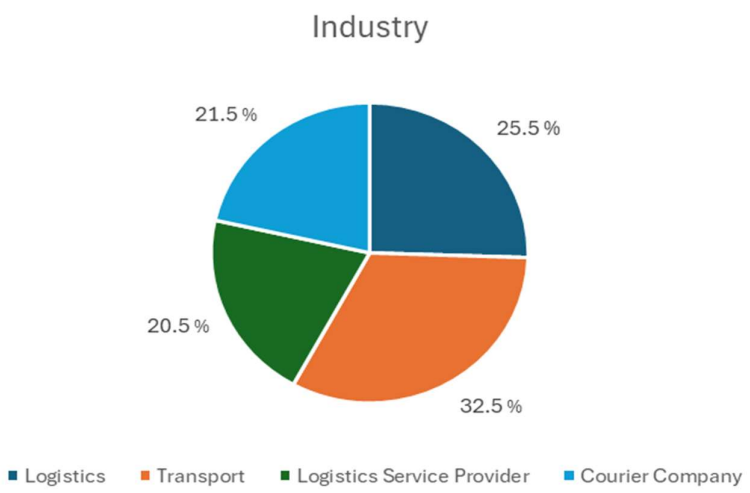
4.2 Descriptive Analysis




Age
2%
22%
35%
28%
13%
20 and below
21-30 years old
31-40 years old
41-50 years old
51 and above


Education Level
3%
15.5%
37%
44.5%
PHD
Master's Degree
Bachelor's Degree
STPM/Diploma/SPM


Working experience in trucking company
28 %
31.5 %
40.5 %
Less than 5 years
5-10 years
More than 10 years


Industry
21.5 %
25.5 %
20.5 %
32.5 %
Logistics
Transport
Logistics Service Provider
Courier Company