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The Relationship between Logistics Technology Innovation and Last Mile Delivery Operational Performance in Selangor, Malaysia

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Abstract

The logistic sector, especially last-mile delivery, has been greatly influenced by Malaysia's fast urbanization and e-commerce expansion. Last mile-delivery has changed from a support role to a crucial component of customer happiness and business success in heavily populated, commercialized areas like Selangor. High delivery costs, the need for quicker service, inefficient routes and rising customer expectations are just a few of the significant obstacles that logistics companies must overcome. Many logistics firms utilize logistics technological advancements like artificial intelligence (AI), GPS monitoring, automation and real time route optimization tools to overcome these obstacles and boost delivery effectiveness. The primary objectives include identifying the current levels of last-mile delivery operational performance and technology innovation in Selangor, and examining the relationship between technology innovation on last mile delivery operational performance. The research employed a quantitative approach, utilizing online questionnaires distributed to logistics companies in Selangor. A total of 182 responses were gathered from a target population of 759 logistics firms. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS), incorporating descriptive, reliability, normality, and Spearman correlation analyses. A pilot study involving 19 respondents was also undertaken to validate the survey instruments. The study found a significant positive relationship between technology innovation and last-mile delivery operational performance, with a Spearman's rho of 0.592 and a p-value of <0.001. This indicates that higher levels of technological adoption leading to better last-mile outcomes in Selangor. Specific aspects like route optimization technology, real-time information usage, and advanced technology for efficiency were highlighted as significant contributors. In conclusion, technology innovation is a critical enabler for enhancing the efficiency, responsiveness, cost-effectiveness, and customer satisfaction of last-mile delivery operations in Selangor. The findings underscore the importance of investing in technological upgrades and strategic frameworks for logistics companies to remain competitive in the evolving digital economy.

1. Introduction

Transportation plays a crucial role in logistics by moving products from their origin to distribution centers and final consumers. Timely and accurate deliveries are essential for maintaining a company's reputation and its capability to meet customer needs. The idea of the "last mile" has emerged as a significant challenge that is currently receiving more attention in transportation logistics. Last mile delivery begins with a strategically located warehouse close to the customer and extends for a short distance to their specific address.

The last mile in supply chain management and transportation planning is the last leg, comprising the movement of people and goods from a transportation hub to a final destination. (Sorooshian *et al*., 2022). The increasing complexity of last-mile delivery has been exacerbated by the recent expansion of e-commerce and the new normal (Viu-Roig & Alvarez-Palau, 2020) Consumers are demanding more online orders, faster deliveries, and more flexible delivery methods (Boysen *et al*., 2021).

Organizations must develop new technologies and business models to remain competitive in e-commerce. Last-mile delivery complexity to meet customers' expectations for speed, timeliness, accuracy, and individual delivery precision drives many businesses to strive for faster, better, and more reliable last-mile delivery than ever (Ranieri *et al*., 2018) Logistics providers face many challenges in last-mile delivery. These include high order fulfillment costs for price-sensitive customers, pressure to offer free delivery, rising customer expectations for faster and more personalized service, tracking options, alternative delivery locations, and frequent failed or returned deliveries (Jucha, 2021).

Many businesses are now seeking ways to create more value through technology. Advances in automation offer chances to build more efficient and sustainable delivery systems. New technologies like driverless vehicles, delivery robots, and drones are laying the foundation for innovative last-mile delivery models (Simoni *et al*., 2020). Other innovations are also being introduced to help solve last-mile challenges.

Recent research by Silva & Junior, (2020) highlights the progressive growth of the urban population in recent decades, which has led to an increase in demand for all types of goods and services in cities. Thus, logistics activities in urban centers have become important to meet people's needs and provide inputs for business activities. Logistic performance significantly impacts organizational and operational performance across various industries. Studies have shown that logistics activities, including transportation, inventory management, procurement, information flow, and warehousing, positively affect operational performance (Dinsa & Kinati, 2024). According to Shuaibu *et al*., (2025), This stage is critical since it involves direct contact with the customer. It is also the most expensive and inefficient part of the supply chain. The growth of e-commerce, coupled with the increasing demands on delivery options, speed, flexibility, and delivery cost, have put last-mile delivery in a significant position among practitioners and researchers.

Every year, logistics providers and delivery companies transport 25 billion packages worldwide. (Statista, 2023) It all runs like clockwork on a carefully coordinated air, land, and sea transport network. However, the most challenging and crucial part for businesses like yours is the "last mile delivery." In Malaysia, the rapid growth of e-commerce has significantly reshaped the logistics sector, leading to a substantial increase in parcel delivery, especially domestic parcels, with a rise from MYR 34.26 million in 2017 to MYR 623.18 million in 2021 (Malaysia, Malaysian Communication and Multimedia Commission 2022). This expansion of e-commerce has necessitated innovations in first and last-mile delivery, as traditional home delivery methods struggled to keep up with the rising demand.

Companies employ more advanced technology and technologically innovative tools to improve the delivery of their products and services (Lauenstein & Schank, 2022). While technology innovation based on route optimization can address the issue by providing real-time information, reducing delivery time, and maximizing routes, many logistics companies in Malaysia, particularly SMEs, have yet to utilize these technologies fully. The last-mile delivery segment continues to be a significant challenge for logistics companies in Malaysia because of traffic jams, inefficient routing, high operational expenses, and customer dissatisfaction.

Resource optimization presents another significant challenge in last-mile operations. Because of the dynamic nature of demand for delivery, complex workforce management systems are needed to balance varying order quantities with available personnel. Urban complexity adds another layer of difficulty, as delivery personnel must navigate congested cities and restricted access zones while maintaining tight delivery schedules. These challenges are particularly acute in urban areas, where population density and traffic conditions can significantly impact delivery efficiency.

Real-time data processing capabilities allow for dynamic decision-making, adjusting delivery routes and schedules based on current traffic conditions, weather patterns, and other relevant factors. Neural networks facilitate complex route optimization, considering multiple variables simultaneously to determine the most efficient delivery paths. (Evitha & Purnaya, 2021). Therefore, to close the knowledge gap in this area, the goal of this study is to empirically investigate the direct relationship between technology innovation and operational efficiency in last-mile delivery operational performance. By identifying the impact of the last mile operational

performance, this research seeks to provide actionable insight for enhance the technology innovation and operational efficiency in last-mile delivery operational performance.

Therefore, to achieve the research objective the current level of last mile delivery operational performance in Selangor, Malaysia is determined. Furthermore, the current level of logistic technology innovation in Selangor, Malaysia. Consequently, the relationship between logistic technology innovation on last mile delivery operational performance in Selangor, Malaysia.

2. Literature Review

2.1 Last Mile Delivery Operational Performance

From past research Lai *et al*., (2022) use logistics performance indicators and criteria like costs, time, and dependability to evaluate supply chain partners' logistical operations. Lead times, delivery accuracy, meeting scheduled delivery commitments, order fulfilment rates, frequency of damaged orders, prompt delivery of urgent orders, performance during peak demand periods, transit time, cargo space availability, and vehicle and container condition are among the most important criteria (Yanginlar *et al*., 2023). The logistics business is developing rapidly due to global trade. Innovative technologies that restructure business are driving this revolution. (Faget, 2024).

Logistics companies face obstacles like transportation delays, which is a big issue for logistics organizations. Traffic congestion, poor road conditions, severe weather, and other variables outside logistics businesses' control might cause delays (Christopher,2016.). Technology has enabled automation, real-time data analysis, and AI to improve logistics performance (Bolumole, Frankel, Nasiri & Simchi-Levi, 2021). Logistics efficiency affects inventory management, customer happiness, and supply chain profitability (Mangan, Lalwani & Butcher, 2016). According Liu, Chen, and Wu (2022) found a link between logistical performance and customer satisfaction. Improved logistics performance leads to faster product and service delivery, enhancing customer satisfaction.

According to Aćimović *et al*., (2022) logistics performance leads to better resource utilization, cheaper costs, and more efficiency, ultimately enhancing organizational success. Many logistics firms use GPS tracking to improve last-mile delivery performance. According to (Moumen *et al*., 2023) GPS tracking helps organizations monitor driver behaviour, traffic, and delivery status, enhancing service punctuality and decreasing operational delays. This will boost delivery operator efficiency and consumer happiness. According Wanganoo & Patil, (2020) Dynamic delivery route design improves last-mile delivery efficiency. (Evitha & Purnaya, 2021)

According to Omar *et al*., (2024) good management of last-mile delivery and satellite depots is the primary component that defines the effectiveness of the supply chain and logistics business, particularly in e-commerce and the on-demand economy. When it comes to satisfying the requirements of consumers, making the most of available resources, and ensuring sustainability, these components are essential. Logistics performance evaluation helps logistics organizations evaluate and improve their operations. Time, quality, flexibility, and cost are generally used to evaluate logistics performance (Rushton *et al*., 2014). Logistics firms can improve their performance by analyzing these indicators and identifying development opportunities.

However, assessing logistics performance is a crucial component of last-mile delivery that helps the logistics forms assess and enhance their operations. Logistics organizations can improve their performance and obtain valuable business insights by assessing these indicators and identifying development opportunities.

2.2 Logistics Technology Innovation

Properly applying this technology improves output and increases commercial competition. As technology and the digital world change, companies worry about falling behind. This fear puts them under stress. Like most industries, AI has revolutionized the logistics industry, especially autonomous vehicles, automation, smart roads, and intelligent analytics and forecasting. According to (Sorooshian *et al*., 2022) this sophisticated technology has simplified and automated many logistics procedures, saving organizations money and time.

AI has many benefits and boundless growth potential, but the logistics sector must first address its difficulties before deploying AI. AI ethics, public policy, and implementation issues arise. In a modern technology era, every field, including the current industrial revelation, will use technology to improve itself, such as robotics, automation, and artificial intelligence (AI), while focusing on safety, flexibility, and collaboration (Khanpara & Tanwar, 2020).

This section discusses the advanced technologies that are currently transforming last mile delivery. Achieving speed, cost-effectiveness, and environmental sustainability in logistics will require the integration of processes with advanced technologies, including Artificial Intelligence (AI), algorithmic optimization techniques, autonomous systems, and the Internet of Things (IoT). These technologies guarantee improvements in route planning, operational efficiency, and customer satisfaction, helping to address some of the fundamental challenges faced by modern logistics systems (Shuaibu *et al*., 2025).

Existing operational capacities depend on knowledge, innovation, and technology, however (Moshood *et al*., 2020) report that several technology-based ways to improving building material tracking have been presented. Technology, particularly AI, reduced costs, strengthened organizations, and improved best practices in logistics and supply chain. Another example is when logistics companies could improve customer service by using real-time data from contemporary technology to reduce disputes and identify faults through network optimization (Wanganoo & Patil, 2020). The purpose of this literature review is to frame and maximize the finest modern last-mile delivery methods.

2.3 Past Research Regarding Logistics Technology Innovation on Last Mile Delivery Operational Performance in Selangor

Last-mile delivery is where clients can see how effectively the service is performing and where it costs the most in the fast-changing logistics business. New technology helps logistics companies remain ahead of the competition and fulfil rising customer demands by improving efficiency. All these factors affect last-mile delivery. Several studies have examined last-mile delivery technology innovation.

H1: There is a positive significant on relationship between logistics technology innovation on last-mile delivery operational performance.

The rapid expansion of e-commerce has created significant challenges for last-mile delivery networks, which represent the final and often most costly segment of the supply chain. Conventional delivery methods are struggling to address the surging demand for quicker, more efficient, and economical solutions (Boysen *et al*., 2019). The features of this technology are also utilized across various industries and carry numerous implications for organizations. The adoption of modern logistics, including recent industry evaluations, heavily depends on AI, which presents both advantages and challenges. According to Woschank *et al*. (2020), AI applications in smart logistics include cyber-physical systems, along with AI, machine learning, and deep learning for facility maintenance. Beyond the actual deployment of these technological concepts, the use of artificial intelligence, machine learning, and deep learning is considered one of the key success factors in the digital transformation process.

According Hoffmann & Prause (2018) assert that autonomous vehicles, such as ground-based robots, can be employed for last-mile deliveries to create added value. Currently, the major players in last-mile delivery comprise established courier services like DHL, along with a number of new startups that are developing delivery robots worldwide. The primary business sectors for delivery robots at this time include perishable goods such as food and flowers, as well as potential applications within the retail and warehousing sectors in the context of automated warehouses. While technological advancements present many benefits, it remains essential to address safety, legal, and infrastructural issues to transform these innovations into practical, sustainable, and effective solutions. Through collaborative efforts, the logistics industry can...significantly improve delivery services to meet the growing demands of urbanization and e-commerce while protecting the environment (Shuaibu *et al*., 2025).

2.4 Research Framework

It shows the relationship between technology innovation on last-mile delivery operational performance, with technology innovation and operational efficiency as independent variable and last mile delivery operational performance as dependent variable. The research is designed to examine how these independent variables collectively impact to last mile delivery operational performance. Fig. 1 display the research framework for this study,

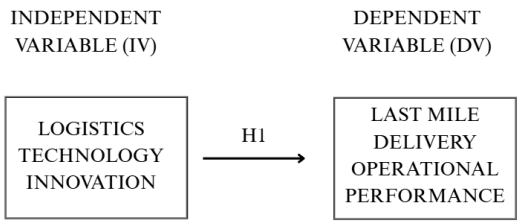

Fig.1 *Research Framework*

3. Research Methodology

3.1 Research Design

Research designs outline how a study will be set up, conducted, and completed. This manual guides researchers through the whole research process, from question generation to data collection and analysis. Well-designed study designs include research methods, sample tactics, data collection technologies, and data analysis processes. The research design should be flexible enough to handle any issues or changes during the study to ensure accurate and powerful findings. This research uses a quantitative method to attain its goal. To answer scientific research issues, quantitative methods collect and analyses numerical data. The quantitative technique is used to summaries, average, find trends, predict, test causal links, and generalize conclusions to larger groups. (Rana *et al*., 2021) Data is collected by questionnaire. The researcher randomly distributed a questionnaire to a sample of logistic enterprises in Selangor, Malaysia who is related to last mile delivery, to collect data. Google e-forms was used to create a survey for this investigation. This study used several statistical methods to verify the results. Thus, SPSS was used to analyses the study's data. For this study, correlation, normally, reliability, and descriptive analysis were used. This research concluded that technology innovation and operational efficiency affect logistics companies' last-mile delivery performance in Selangor, Malaysia.

3.2 Research Population and Sample

In research, "population" refers to the specific group or entity being studied. Populations define the study's bounds and provide its context. They also allow the reader focus on specific spots within a range. To prevent providing the same results to everyone, a specific focus is needed. (Hossan *et al*.,2023). The study targets Selangor because is good for logistics due to its large ports and airports, which promote international commerce and economic operations (Invest Selangor, 2023). The Selangor Freight Forwarders and Logistics Association (2024) found 759 logistics enterprises that meet the criteria. International logistics firms prefer Selangor's location, infrastructure, and business climate (Invest Selangor, 2024). According Krejcie & Morgan (1970) evaluated 254 respondents from 759 logistic enterprises in Selangor, Malaysia. Thus, Selangor's logistics enterprises provide a complete sample that answers the research question and represents Malaysia's logistics sector.

3.3 Sampling Method

Sampling is picking a subset of people or items from a larger group for research or analysis (Babbie, 2020). According Omair (2014) there two types of sampling methods which is probability and non-probability. Probability sampling selects individuals or things randomly from the population to ensure that everyone has an equal chance of being sampled (Shin, 2022). Non-probability sampling includes convenience, judgement, and quota (Nikolopoulou, 2022). This study employed a purposive sampling method to collect data from respondents who are directly involved in last-mile delivery operations in Selangor, Malaysia. According (Etikan, 2016). The purposive sampling technique, also called judgment sampling, is the deliberate choice of a participant due to the qualities the participant possesses. This involves identification and selection of individuals or groups of individuals that are proficient and well-informed with a phenomenon of interest.

3.4 Data Collection

Data collecting methods are very important in research because they let researchers get information from a lot of different places to answer their research questions (Bhandari, 2022). This study employed primary data-gathering methods to find out how the last mile delivery operational performance in Selangor, Malaysia affects the logistics technology innovation. This way of gathering data gave a full picture of the logistics companies in Selangor and how technology innovation helped them succeed. The researcher was able to make sure that the results were accurate and reliable and that they helped people understand the research topic better by using a number of ways to collect data.

3.5 Pilot Study

A pilot study is a preliminary inquiry undertaken on a small scale prior to a bigger study. Its purpose is to assess the feasibility and effectiveness of the proposed research design (Shuda, 2022). In a pilot study, this study gathers data using identical instruments that will be employed in the subsequent, more extensive investigation. In this particular research endeavor, a pilot study was undertaken involving a sample of 19 logistics companies located in Selangor, Malaysia. Consequently, reliability tests were administered to validate the study instruments, notably the survey questionnaire. The Cronbach's alpha technique, a statistical approach, was subsequently applied to evaluate the reliability and consistency of the scale or instrument measuring a specific construct. This technique was utilized to ascertain the internal consistency of the data and to affirm the reliability and consistency of the instruments. The questionnaire for independent variable and dependent variable will be adapted from the article (Prapinit *et al*., 2024) for independent variable and two main articles from same as independent variable and article from (Mai *et al*., 2022) for dependent variable.

3.6 Research Instrument

The research instrument is a crucial one in the research process, which is used to gather or measure the quantity of a given variable (Yusup, 2018). A questionnaire is a common tool used by researchers to gather data. To collect data from 254 respondents working for logistics companies in Selangor, Malaysia, the researcher used Google e-Forms to create an online questionnaire. Section A, B, and C are the three main portions of the questionnaire. First, respondents are asked to provide demographic data in Section A, such as gender, age, race, education, job title, yearly turnover of the logistics company and number of workers in logistic company with using nominal and ordinal scales. As a result, the focus of Section B is on logistics technology innovation on last mile delivery performance. In Section B, respondents were surveyed using a five-point Likert scale to collect data. In Section C's second independent variable is considering operational efficiency on last mile delivery operational performance. Similar to Section B, the investigator utilized a five-point Likert scale to gather information from participants in Section C. The instrument was pre-tested for clarity and relevance and further refined to ensure alignment with the study objectives. The internal consistency and reliability of the constructed were validated through Cronbach's Alpha Analysis.

Table 1 *Questionnaire that have adapted for Independent Variable and Dependent Variable in Section B and Section C*

Variables	Adapted from	Item	Likert Scale
Independent Variable Logistics Technology Innovation	(Prapinit *et al*., 2024)	7	5-Point Likert Scale 1.Strongly Disagree 2.Disagree 3.Neutral 4.Agree 5.Strongly Agree
Dependent Variable Last Mile Delivery Operational Performance	(Prapinit *et al*., 2024)	6	

3.7 Data Analysis

Data analysis is a key part of a study since it uses statistical methods to look at and understand the data that the researcher has gathered. This study used four basic types of statistical analysis which is descriptive analysis, reliability analysis, normality analysis, and correlation analysis. We utilized descriptive analysis to get a general idea of the data and to find the measures of central tendency and variability. We also did a reliability analysis to see how stable and consistent the measurements utilized in the study were. We also did a normality test to see if the data were normally distributed, which is something that many statistical tests assume. Finally, correlation analysis was used to look at how two or more variables are related to each other. Descriptive analysis to summarize and describe the data and correlation analysis as part of inferential statistics is crucial to analyze the relationship and the hypotheses whether logistics technology innovation truly influence last mile delivery operational performance in a statistically meaningful way.

4. Results and Discussion

4.1 Survey Return Rate

182 out of 254 respondents responded and submitted the questionnaire to the researcher with a total response rate of 71.65%. The survey return rate was summarized in Table 2 below.

Table 2 *Survey Return Rate*

Population	Sample Size	Questionnaire Distribute	Percentage (%)
759	254	182	71.65%

4.2 Reliability and Validity Analysis

4.2.1 Reliability and Validity of Pilot Study

The researcher has found 19 respondents who relate to last mile delivery in logistic company Selangor as the target respondents to carry out the pilot study for evaluating the practically and feasibility of the main research the study conducted reliability test on the "logistics technology innovation" and "last mile delivery operational performance". Cronbach's Alpha reviews for logistics technology innovation are 0.874 and for last mile delivery operational performance is 0.803, respectively falling within the acceptable range (0.8 to 0.7) for internal consistency. Table 3 showed that the value of Cronbach's Alpha for the pilot test for 19 respondents.

Table 3 *Reliability test for pilot study*

Variable	Cronbach's Alpha	N- Item in Scale	Interpretation
Logistics Technology Innovation	0.874	7	Good
Last mile Delivery Operational Performance	0.803	6	Good

4.2.2 Reliability and Validity for Actual Study

The researcher conducted a comprehensive study by distributing 182 questionnaires to respondents who are directly involved in last-mile delivery operations in Selangor, Malaysia. The study examined the reliability of technology innovation and last mile delivery operational performance. The results revealed that "logistics technology innovation" demonstrated acceptable with a Cronbach's alpha coefficient of 0.740. Last mile delivery operational performance also showed an acceptable level of Cronbach's alpha value of 0.712. In summary, the study's variable shows different levels of reliability. The reliability test for actual study had been summarized in Table 4.

Table 4 *Reliability Test for Actual Study*

Variable	Cronbach's Alpha	N- Item in Scale	Interpretation
Logistics Technology Innovation	0.740	7	Acceptable
Last mile Delivery Operational Performance	0.712	6	Acceptable

4.3 Descriptive Analysis for Demographic Profile

Table 5 shows that 182 respondents are involved in this research, categorised by gender, age, race, education, job position, years of experience in a logistics company, and the number of workers in the logistics company. As illustrated in Table 5, majority were male (52.70%), 30 – 39 years (55.49%), Malay (57.69%), Bachelor's Degree (58.79%), logistic managements (35.16%), Supervisor (32.42%), 4 - 6 years experienced in logistic company (56.04%) and 51 – 100 employees in logistic company (50.55%).

Table 5 *Summary of Demographic Analysis*

Demographic	Details	Frequency	Percentage (%)
Gender	Male	96	52.7%
	Female	86	47.3%
	Total	182	100
Age	20 – 29 Years	47	25.82%
	30 – 39 Years	101	55.49%
	40 – 49 Years	25	13.74%
	50 Years and above	9	4.95%
	Total	182	100
Race	Malay	105	57.69%
	Chinese	48	26.37%
	India	27	14.84%
	Bumiputera Sabah	1	0.55%
	Punjabi	1	0.55%
	Total	182	100
Education	Secondary school	-	-
	Diploma	26	14.29%
	Bachelor's Degree	107	58.79%
	Master's Degree	49	26.92%
	PhD	-	-
	Total	182	100
Industry Type	Operations	35	19.23%
	Logistic managements	64	35.16%
	Supply chain officers	40	21.98%

	Delivery coordinators	41	22.53%
	Airfreight forwarders	1	0.55%
	International department	1	0.55%
	Total	182	100
Job Position	Senior Manager	27	14.84%
	Manager	39	21.43%
	Assistant Manager	25	13.74%
	Supervisor	59	32.42%
	Senior Executive	27	14.84%
	Executive	5	2.75%
	Total	182	100
Years experience in logistic company	Less than 1 year	2	1.10%
	1 – 3 Years	30	16.48%
	4 – 6 Years	102	56.04%
	7 – 9 Years	33	18.13%
	10 Years and above	15	8.24%
	Total	182	100
Numbers workers in logistic company	1 – 10 employees	8	4.40%
	11 – 50 employees	33	18.13%
	51 – 100 employees	92	50.55%
	101 – 500 employees	43	23.63%
	More than 500 employees	6	3.30%
	Total	182	100

4.4 Descriptive Analysis

Descriptive analysis was developed to examine the relationship between logistics technology innovation and last mile delivery operational performance in Selangor, Malaysia. Based on Table 6, the mean score for all variables indicates a high level of tendency. The independent variable, technology innovation recorded a mean score of 4.45 and standard deviation of 0.587. similarly, the dependent variable, last mile delivery operational performance, also achieved a mean score of 4.44 and standard deviation 0.563, indicating a high level.

Table 6 *Results of Descriptive Analysis*

Variable	Mean	Std. Deviation	Level
Logistics Technology Innovation	4.45	0.587	High
Last mile Delivery Operational Performance	4.44	0.563	High

4.5 Normality Test

The Kolmogrov-Smirnov test was used on 182 respondents in Table 7 to determine the normality of the dependent variable (last mile delivery operational performance). The test revealed a statistic of 0.148 with degree of freedom and the associated p-value was less than 0.001. which indicated a significant value and be assumed as abnormal data since the value is below 0.05 and this study will proceed with conducting a Spearman's correlation analysis.

Table 7 Results of Normality Test

Variables	Kolmogrov-Smirnov			Shapiro-Wilk		
	Statistics	Df	Sig.	Statistics	Df	Sig.
Logistics Technology Innovation	0.135	182	<0.001	0.944	182	<0.001
Last Mile Delivery Operational performance	0.148	182	<0.001	0.935	182	<0.001

4.6 Spearman's Correlation Analysis

The correlation coefficient between logistics technology innovation and last mile delivery operational performance was 0.592, indicating a moderate association. The p-value was less than 0.001, indicating that there

is a positive association between logistics technology innovation. The relationship was analyzed with a sample size of 182, suggesting reliable findings.

H1: There is a positive relationship between logistics technology innovation and last mile delivery operational performance.

Table 8 *Correlation between the Logistics technology innovation and last mile delivery operational performance*

	Spearman's rho		Overall Mean Logistics Technology Innovation
DV	Overall Mean Last Mile Delivery Operational Performance	Correlation coefficient	0.592*
		Sig (1 tailed)	<.001
		N	182

5. Conclusion

In a nutshell, this study has provided useful insight into the relationship between technology innovation and last-mile delivery operational performance in Selangor, Malaysia. the study successfully achieved three main objectives which are the current level of logistic operational performance last-mile delivery in Selangor, Malaysia, the current level of technology innovation in Selangor, Malaysia and to examine the relationship between technology innovation on last-mile delivery operational performance in Selangor, Malaysia. Based on the findings, it establishes that technology innovation is integral to achieving last mile delivery operational performance, with each aspect contributing uniquely to the optimization of technology innovation. Despite the promising correlations, the high levels of implementation observed indicate significant potential for improvement. The findings show a moderate, positive and significant correlation between the two constructs, these results suggest that greater technology innovation is associated with better last-mile delivery operational performance and that technology acts as a key enabler speed, reliability, cost efficiency and service quality in the Selangor logistics context. To build on the findings, companies must invest in technological upgrades, strengthen partnerships and expand their strategic focus beyond regional limitations. By addressing these gaps, logistics firm can achieve higher levels of efficiency, adaptability and competitiveness, positioning themselves for sustainable growth in a rapidly evolving industry.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Nur Sabrina Abdul Halim and Mohd Zarir Yusoff;* ***data collection:*** *Nur Sabrina Abdul Halim;* ***analysis and interpretation of results:*** *Nur Sabrina Abdul Halim;* ***draft manuscript preparation:*** *Nur Sabrina Abdul Halim and Mohd Zarir Yusoff. All authors reviewed the results and approved the final version of the manuscript.*

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