

# Factors Influencing Logistics Management of 3 PL Service Companies to 4 PL in the recession of COVID-19

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**Abstract.** This research aims to explore 1. the fundamentals of a logistics service company with a lean concept with the transformation factor of 3PL and the development of logistics management from 3PL to 4PL, 2. the relationship between fundamental factors and transformation factors of 3PL, 3. the relationship between change factor and Development of Logistics Management from 3LP to 4P, 4. the fundamentals influencing the development of logistics management from 3PL to 4L, and 5. the transformational factors of 3PL influencing the development of logistics management 3PL to 4PL. with the lean concept of transition from eliminating extravagance and waste to value based on the clients concept: eliminating tasks resulting in balance and profit. The samples used in this research were Logistics service company in Bangkok and perimeter. This is a survey research. Questionnaires are tools for collecting data. Data analysis through percentage, mean, and standard deviation, Chi-square test statistics, Pearson correlation coefficient, and multiple regression analysis. especially if supply chains were disrupted. COVID-19 also added to the uncertainty of the business operation.

## 1 Introduction

The Thai economy in 4/2020 is expected to contract near the third quarter amid government stimulus measures to household spending as a supporting factor with a tendency to shrink at least -7.0%. Direction of the recovery of the Thai economy in 2021 still faces many uncertainty factors. Moreover, the situation of the coronavirus is more severe in the US and Europe brought to the use of another round of lockdown measures in many European countries.

The vaccine access, no earlier than in late 2021 with the US economy, still has a high risk. The U.S. administrative transition is at a turning point in the US COVID crisis, but there is a high probability that the Republican Party will retain a majority in the Senate which will be more difficult to let the legislation decrees especially large economic stimulus plans pass. In particular, large economic stimulus plans will be difficult. The COVID-19 outbreak has highlighted the challenges of adapting the need to involve all supply-chain nodes in creating an integrated approach to supply-chain risk management [1].

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As [2] point out, the COVID-19 era, many new challenges arise and conducts a simulation study to forecast how COVID-19 would affect global supply chain operations. Finally, the uncertainty of Thai economy has not been reduced. The recovery of the world economy amid the uncontrollable virus outbreak affects the plans for foreign tourists in Thailand. The strong baht direction affects export income. The factors affecting the said foreign income will have an effect on the decline in employment in the country impacting on the household expenditure including the credit quality in the financial system (Kasikornthai Research Center, 16 Nov.2020). Although the investment of both the central government and state enterprises continues to expand and plays an important role in supporting the economic recovery, the value of merchandise imports contracted 12.1 percent from the same period last year.

Excluding gold imports, 9.9 percent of the import value contracted. As customer demand is declining and supply chains are disrupted as countries close and border closures [3, 4]. As the coronavirus pandemic was a danger to health and life for the global population, governments needed to measures than during a conventional recession, such as lockdowns [5,6]. As a result, transport companies had to stop their cross-border logistics and factories were forced to reduce or stop production. Thus, compared to a conventional recession, the coronavirus pandemic not only caused a decreasing demand but also supply shortages. As a result, companies are facing the challenge both to sell their offerings and to maintain their capabilities for production—a unique set of challenges, which probably gave rise to our finding that some customers became more likely to purchase low-priced offerings, 4PL may turn the crisis into a competitive opportunity.

The contraction was higher from the previous month in almost all product categories. Both importing fuel, consumer goods and capital goods were consistent with the contraction of domestic expenditure. The general of economic stability and inflation became less negative as energy prices increased significantly.

However, the inflation rate decreased. The radical change of both internal and external environment created new forms of work such as Work from Home resulting in changing of conditions and factors of competitive advantages [7].

Some products used to be important export products with high growth rates began to suffer competition problems and lost some of the market. This makes Thailand need to accelerate the restructuring of the industrial sector in order to make Thai industrial sector respond the market demand and have a comparative advantage in the competition in the world market. With sustainable growth under management conditions that do not cause any impact on the environment. In the globalization era and today's extremely high market competition, there is a new principle in Department of Business Administration, Marketing and Industry [8]. In this age, it is necessary to turn to consider the businesses around both vertically and horizontally. Vertical cooperation of businesses includes real products on their production from raw materials starting from suppliers, suppliers, manufacturers, distributors and customers.

As the horizontal cooperation includes the business promoting, supporting, or being a useful partner to increase productivity which will enhance the ability of people that may be a business that has similar characteristics. The concept of surrounding business cooperation is a concept called Supply chain. In fact, there will be a development of a supply network from the present to the future. As [9] point out, The fastest information sharing and cooperation among supply chain stakeholders is critical. The link between the supply chain and the use of lean is the transition from eliminating waste to value. This concept will make business operations in this era more efficient and smooth.

Operating costs are reduced. The amount of inventory required in the industry is reduced resulting in many benefits to every part of the supply chain. The effects of technology and offshoring are difficult to predict, as the effects are strongly context-

specific, and may interact subtly. It is difficult to predict what stage in the production process can be offshored or substituted by, for example, a robot. And importantly, it is difficult to predict what the effects will be, because these effects are “more individual, more sudden, more uncontrollable, and more unpredictable” [10,11].

Bringing this idea to Thailand regardless of entering through the policy of multinational companies, pressure from foreign companies with partners in Thailand or by realizing the benefits of this concept, causes businesses and industries in Thailand to be alert and interested in bringing this concept into practice in the organization. The draft Master Plan for Logistics Development of Thailand states that at present, a globalized development trend focusing on liberalization of government and international services increases of the higher competition of the business [12]. At the same time, the development of advanced technology changed the competitive nature of the business from taking advantage of low cost factors of production into raising the level of production efficiency competition focusing on innovation to offer added value proposition to customers [13]. From such phenomena, limited resource conditions pushes the business sector focussing on production efficiency due to the core business activities and getting rid of non-core business activities.

In particular, some logistics services should be performed by outside experts on their behalf. This can help them greatly reduce operating costs and increase the added value of the business. For example, studies have shown that hiring a logistics provider can help reduce shipping and warehouse costs in the business sector by 15-20 percent and improve the quality of services available to consumers. For example, by shortening the delivery time to the consumer by 10-20 percent [14].

Therefore, with the potential of using logistics services to build the capacity of such businesses, it clearly shows that If Thailand is to develop logistics as a key factor for enhancing competitiveness, it is very important to accelerate the development of the logistics service business as strong as developed countries. For example, in Europe, studies have shown that business operators are using the services of the logistics service business in a very high level, especially 91 percent in the transport sector (Logistics Service Providers: LSPs).

So it can be said that Logistics service business in the Asia Pacific region will play an important role [15] and have the potential to grow significantly in the future expected to expand 3-4 times the region's average economic growth rate (4% per year) or approximately 12 -15%, especially in the electronics industry, consumer products, chemicals, electric vehicles and textile products as the result of three drivers of social economy: 1) Government development and investment to diversify wealth to other cities. In addition to the main city to the secondary city 2) the rapid expansion of the new retail business which is an important business relying heavily on logistics services and 3) the expansion of demand for industrial products from various countries around the world (Third Party Logistics Service Provider: 3PL).

It is a company that provides various logistics services. These services are offered as a complete package or as a package of services, namely Logistics, Warehouse, Coss-Docking, Inventory Management, Packaging and Freight Forwarding. Fourth Party Logistics Service Provider: 4PL is a very highly integrated logistics provider. It will be responsible for managing and controlling each 3PL service provider to be able to link the work as the one who brings the resources. Skill and technology higher at the 5G level, are combined to achieve comprehensive delivery of services in the supply chain [16, 17].

Long supply chains also affect economies in other ways, which are especially the COVID-19 crisis. The longer the supply chain, the longer it, for instance, took to recover from the crisis. [18] study the resilience of countries after trade collapses. The main conclusion of their analysis is straightforward: A strong involvement in global supply chains raises the size of the decline, and slows down the recovery of countries following a

recession. As [19] point out, Caused by the COVID-19 lockdown impacted both product and service businesses, but service businesses are showing higher resilience. The differences of 3PL and 4PL are as follows.

1. 4PL organizations are often formed by joint ventures or there is a long-term contract between the customer and the logistics provider.

2. The organization of the 4PL is like the customer's first point of contact with logistics service providers.

3. Various perspectives of customers in the supply chain will be managed by the organization of the 4PL.

4. Large 3PLs may be in the form of a 4PL organization.

Various pressures in the world of doing business has a turn to shake hands with businesses around them both vertically and horizontally. This concept also makes tight logistics service providers (3PL) cooperate to achieve efficient management, flexibility and reduce the burden of investment risks. It is, therefore, necessary to develop business management by having a middleman to manages and coordinate between 3PL service providers, customers and raw material suppliers, that is, the 4th Logistics Service Provider (4PL), which is a logistics provider at the level with high integration responsible for management controlling each 3PL service provider to be able to link their operations, also known as One-Stop-Shopping services, to achieve comprehensive delivery of services in the supply chain. Therefore, the researcher is interested to explore in order to benefit the development of logistics management in the future. [20] point out, Synergised with Point-to-Point operations, Ultra Long-Haul (ULH) can provide Full Service Network Carriers with greater flexibility and agility.

### **1.1 The results were found as follows**

1. Fundamental factors of the sample as business such as a freight forwarding joint venture with foreign countries with the registered capital are between 11 - 50 million baht and the number of employees in the company between 101-500 people.

2. Factors of change of 3PL based on the majority opinions of the sample both overall and each aspect were at a high level in all 6 aspects: adding value to the service, management and cooperation with lean concept and agility efficiency of data communication, cost reduction, and problem solving aspects of 3PL with lean concept and development of 3PL to 4PL logistics management. The overall and each aspect were at a high level in all 5 aspects, namely, the leading time, for both vertical and horizontal network development, service, quality and capital.

3. There is no relationship between fundamentals and the factors of change of 3PL

4. There was a positive correlation between the factors of the transformation of 3PL and the development of logistics management 3PL to 4PL. The correlation coefficient was moderate both in overall and in each side.

5. Fundamental factors had no influence on the development of logistics management 3PL to 4PL of logistics service providers.

6. The 3PL changes influencing the development of logistics management 3PL to 4PL of logistics service companies are the 3PL problem elimination factor, the lean concept and mobility.

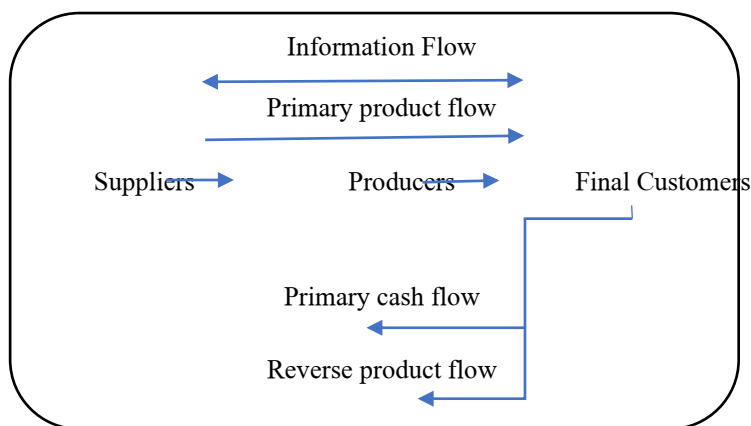
### **1.2 The objectives of research**

1. To explore the fundamentals of logistics service companies, the transformation factor of 3PL and the development of logistics management from 3PL to 4PL based on the lean concept.

2. To explore the relationship between fundamental factors and changing factors of 3PL.
3. To explore the relationship between the transformation factor of 3PL and the development of logistics management from 3PL to 4PL based on the lean concept.
4. To explore fundamental factor impacting on the logistics management development from 3PL to 4PL.
5. To explore the changing factors of 3PL impacting on the development of logistics management from 3PL to 4PL based on the lean concept.

## 2 Literature Review

Logistics is the process of managing, planning and controlling activities in both the moving and non-moving areas, aiming to provide the convenience of the process of the flow of goods or services from the point of procurement of raw materials to the point of consumption and conveying of products, and achieving the lowest total cost. Logistics is a part of the supply chain. Since logistics is a link between the activities of moving objects within the organization with few rules to the movement of raw materials and goods between organizations or supply chains with restricted rules or regulations between organizations such as price, quantity, quality, and product specification inspection. The logistics process can be divided into three main processes: purchasing, inbound logistics and outbound logistics. All activities work together in a systematic manner to control the return and flow of raw materials and goods through various logistics activities from the supplier of the inputs to the final consumer shown in Figure 1



**Fig. 1.** Logistic activities.

### 2.1 The lean principles are as follows

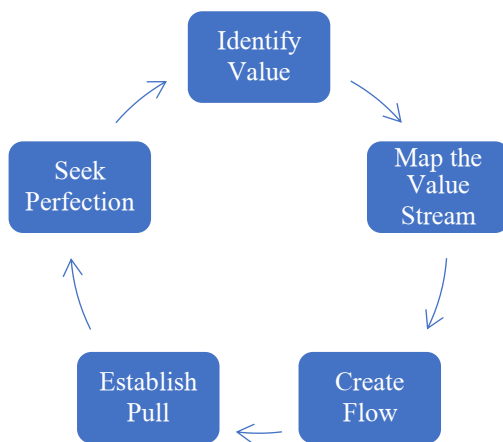
1. Identify is to specify the value or what the customer needs in order to be able to produce products or deliver services accurately as the customer truly wants.
2. Value Stream Mapping identifies steps or processes of production or service for each product or service at the core of the organization and eliminates processes that do not create value in the eyes of the customer to a minimum.
3. Flow is improving, develop or creating processes so that products or services can flow smoothly to the customer or to the next process smoothly and quickly.

4. Pull is delivering products or services to customers or processes to meet the exact quantity and time required by the customer.

5. Perfection is continuously improving and developing until the working process is efficient and sustainable forever.

For the lean 2 concept, the production or administrative steps of each product are specified. It is therefore necessary to create the Value Stream Mapping, a tool to support the development of process productivity by showing a sequence of activities aimed at delivering value to the customer and giving an overview of the process as well as improving the flow of resources and identifying activities to eliminate wastes. So, the VSM is often used to classify value-added and wasteful activities by taking the results from the current state analysis, which is displayed in the document to determine the status after the future state and advance to the ideal process (Idle State) from the starting process to the final customer with the principle of 7 + 1 Waste.

Reducing the activities that are not creating value in the process, such as order fulfillment, production, delivery, billing and after-sales service, etc. The resulting value is linked between the process is called a stream of value. Similar products or service models are integrated into the same value stream. The most importantly, we must not forget to measure the cycle time of production or service to be accurate by recording the production time and finding the average cycle time of the products produced each day as well.



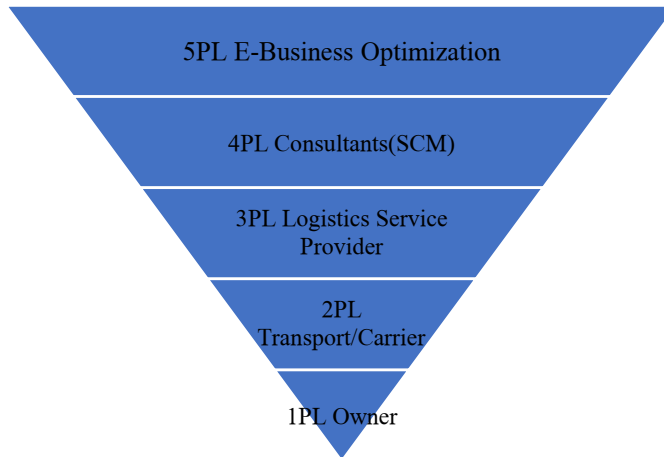
**Fig. 2.** Cycle production.

Cycle time is the time for producing a product or service per person per unit = time (seconds) / number of units \* Number of production people). Finding the average Cycle time of the production of a particular process by taking the average time of producing the product each day divided by the average number of products produced each day multiplied by the average number of people produced each day to compare with Takt time. It is the actual time a customer needs the product per day. If one employee's cycle time is slower than the customer's takt time, that means that the manufacturer cannot produce the product in time to deliver the customer. Therefore, there will measure the Cycle time of production every day analyzed to make the production cycle time lower according to the Takt time of the customer and there will be the least stable or variable (Variable) as compared to the Cycle time. Figure 2

3 PL read as Third Party Logistics refers to the company that provides customers with various types of logistics services, for example, delivering parts from a supplier to the factory. Delivery of finished products from the factory to the shop or dealer typically, a 3

PL provides a range of services such as logistics, warehousing for storage, cross-docking, and packaging 3 PL.

4 PL (Fourth Party Logistics) means a person who provides consulting services or coordinates logistics usage guidelines for customers in selecting 3 PL in order to have management within the supply chain efficiently and effectively. The 4 PL organization has special expertise in management and technology because the 3 PL has to be used to manage and organize various systems for all 3 PLs to work more efficiently. The more 3 PL in the system or organizational logistics process, the more complex and complex it has to be due to coordination. Thus, the 4 PL must be used to manage the 3 P shown as Figure 3.



**Fig. 3.** Party Logistics.

## 2.2 The benefits of research

1. Know the potential and readiness of the company, logistics service providers in Bangkok and perimeter towards the logistics management change from 3 PL to 4 PL.
2. Be able to present obstacles, limitations, and regular recommendations and useful benefits of 4 PL Logistics to a Lean Concept Logistics Service Company.
3. Be a body of knowledge for those who are interested leading to the in-depth relevant research.

## 2.3 Research scopes

1. The population used for the explore was a 3 PL logistics service company registered with the Department of Business Development in Bangkok and surrounding areas only. Those companies may have various logistics service activities. The researcher will take only the core business in the classification of the business
2. It is a explore of factors influencing the development of logistics management 3 PL to 4 PL of logistics service companies registered with the Department of Business Development in Bangkok and perimeters.
3. The source of information to be collected is the managing director of the company. 3 PL Logistics Service Provider registered with the Department of Business Development in Bangkok and perimeters.
4. Period for collecting data for research studies is from August to December 2020.

### 3 Research methods

The researcher will conduct a survey research, a 3 PL logistics service company in Bangkok and surrounding areas. The project will explore data from the samples using questionnaires.

#### 2.1 Population and analysis units

The population used in this explore is a 3 PL logistics service company with 82 companies registered with the Department of Business Development. The analytical unit is a company unit, with the informant being the managing director of the 3PL anti-logistics service in Bangkok and perimeters.

#### 2.2 Sample selection and sampling plan

The population were logistics 3PL in Bangkok and its perimeters registered with the Department of Business Development, Ministry of Commerce. The sample size was determined by the Taro Yamane formula [7], which determined the sample size that could be used to represent the sample by using the formula for calculating as follows:

The formula for calculating the number of samples

$$n = \frac{N}{(1+Ne^2)}$$

n = Sample size

N = Number of population units

e = Acceptable discrepancy

The population were from 82 companies registrated with the Department of Business Development of 3PL logistics service providers in Bangkok and its perimeters. The discrepancy level is set at e = 0.05 or the confidence level of 95% is as follows:

$$n = \frac{82}{(1 + (82 \times 0.05^2))}$$
$$= 68.05$$

The sample size is calculated as 68.05 companies. Therefore, the researcher considered only 68 companies to answer the questionnaire. A simple sampling technique (Sampling Technique) by means of a non-return drawing of the number of sample groups to answer the questionnaire was applied.

#### 2.3 Research instruments

The tools used to collect data were a closed-ended questionnaire, and an open-ended question of suggestion. The questions were divided into 3 parts as follows

Part 1 is a question about the fundamental factors of the sample. It is a check-list question.

Part 2 is a question about the factors of 3PL transformation influencing the development of logistics management of 3PL to 4PL in terms of the lean concept of logistics service companies based on the concepts of samples.

Part 3 is a question on the development of the 4PL logistics people management based on the lean concept of various logistics service companies.



## 2.4 Data collection

In this explore, data would be collected as follows:

1. Procedures for requesting recommendation letters from Shinawatra University for use in the delivery of questionnaires to logistics service companies for requesting cooperation in answering the questionnaire.
2. Data collection will take a total of 4 months from August to November 2020.
3. The questionnaires by e-mail and electronic mails together with phones will be analyzed
4. The data obtained is statistically coded and analyzed by sing a complete program.

## 2.5 Data analysis

Data were analyzed as follows:

1. Frequenny and Percentage distributions use were usedd to analyze fundamental factors.

2. Mean and standard deviation (Sandand Deviation) in the analysis, factors of change of 3PL, logistics development of 4PL logistics service company, factors of 3PL transformation and development of 4PL logistics management, and lean concept of logistics service companies using the Likert Scale score were organized as a division for interpreting this level of acceptance [8].

The maximum number of levels = (highest score - lowest score) / number of floors

Substitute =  $(5-1) / 5 = 0.80$

Average score 1.00-1.80 means very little priority.

Average rating of 1.81-2.60 means less important.

Average score 2.60-3.40, mean of medium importance.

Average rating 3.40-4.20 means is very important.

Average rating of 4.20-5.00 means most important

3. The relationship between fundamental and transformation factors of 3 PL using Chi-square test statistics was applied.

4. The relationship between the factors of transformation of 3 PL and the development of logistics management 3 PL to 4 PL in the lean concept of a logistics service company by Pearson's Product-moment Correlation Coefficient was used to interpret the correlation values for both positive and negative directions.

Correlation from 0.00-0.20 indicates a very small correlation.

Correlation from 0.21-0.40 indicates a low correlation.

Correlations ranging from 0.41-0.60 indicates moderate correlation.

Correlations ranging from 0.61-0.80 indicates high correlation.

Correlation from 0.81-1.00 indicates most correlation.

5. The factors of change of 3 PL influencing the development of logistics management from 3 PL to 4 PL in the lean concept of logistics service companies were analyzed by multiple regression analysis.

6. Fundamental analysis influencing the development of logistics management from 3 PL to 4 PL in the lean concept of logistics service companies was analyzed by Muliple Regression Analysis.

## 3 Result of data analysis

A research of “Factors Influencing Logistics Management of 3 PL Service Companies to 4 PL in the recession of COVID-19” was a survey research. The data was collected by 68 questionnaires of the sample. The respondents were managing director level of logistics service companies in Bangkok and its vicinity. The samples returned 48 sets of questionnaires, representing 70.58%.

**Table 1.** Mean ( $\bar{x}$ ) and Standard Deviation (S.D.) Opinion of service companies about factors of change of 3 PL.

Aspects of Development	Level of opinion		
	$\bar{X}$	S.D.	Interpretation
Cost reduction with Lean concept	3.88	0.475	much
Adding value in service with a lean concept	4.39	0.587	most
Eliminating various problems of 3PL	3.85	0.548	much
Efficiency of data communication	3.94	0.664	much
Management and cooperation	4.11	0.621	much
Aspects of lean use and mobility	4.05	0.619	much
<b>Total</b>	<b>4.04</b>	<b>0.467</b>	<b>much</b>

From the table, it was found that the opinions of logistics service companies, the overall of the factors of the change of 3 PL were at a high level. ( $\bar{x} = 4.04$ ) Considering each aspect, it was found that the the 1 side was at the highest level: Adding value in service with a lean concept ( $\bar{x} = 4.39$ ) 5 aspects with the highest were mean Management and cooperation( $\bar{x} = 4.11$ ) followed by lean and mobility ( $\bar{x} = 4.05$ ) and efficiency of data communication respectively ( $\bar{x} = 3.94$ ).

Analysis results about the opinion of Logistics Service Company on the development of logistics management 3 PL to 4 PL based on the the lean concept From this explore focusing on the opinions of logistics service companies in Bangkok and its perimeters. The development of logistics management from 3 PL to 4 PL was analyzed by Mean and Standard Deviation. The results of the data analysis were shown in the table.

**Table 2.** Mean ( $\bar{x}$ ) and Standard Deviation (S.D.), Opinion of Logistics Service Company towards the development of logistics management from 3PL to 4PL with the lean concept.

Development of logistics management from 3 PL to 4 PL with the lean concept.	Level of opinion		
	$\bar{X}$	S.D.	Interpretation
Quality	4.05	0.526	Much
Cost	3.85	0.617	Much
Service	4.24	0.565	Most
Leading time	4.26	0.583	Most
Development of vertical and horizontal networks	4.26	0.486	Most
<b>Overall</b>	<b>4.13</b>	<b>0.438</b>	<b>Much</b>

From the table, it was found that the opinions of logistics service companies towards the development of logistics management from 3 PL to 4 PL with the lean concept was overall at a high level ( $\bar{x} = 4.13$ ). However, considering each aspect was found that 3 aspects: leading time and vertical and horizontal network development had the highest average value ( $\bar{x} = 4.26$ ), followed by service ( $\bar{x} = 4.24$ ) and quality ( $\bar{x} = 4.05$ ), respectively.

Analysis results for finding relationships between fundamental factors and the transforming factor of 3 PL by using Chi-square test statistics. The analytical results was shown in the table. 3

**Table 3.** Analysis of the relationship between fundamental and change factors of 3PL classified by business type.

Business Type	Overview Opinion						
	Average	Much	Most	Total	$\chi^2$	Df	Sig.
Goods transportation	2	20	6	28	7.592	6	0.27
Storing, maintaining, managing warehouse and labeling or packaging	0	2	0	2			
Giving ceremonies service related to logistics	4	9	3	16			
Service of information about technology and logistics consulting work	1	0	1	2			
<b>Total</b>	<b>7</b>	<b>31</b>	<b>10</b>	<b>48</b>			

\* P < 0.05

From the table of results of correlation between fundamental factors and change factors of 3PL classified by business type, it was found that the opinions of logistics service companies with different types of businesses about the opinion based on development of Logistics Management from 3PL to 4PL with the lean concept were not statistically significant at 0.05.

## 4 Research conclusion

A explore of “Factors Influencing Logistics Management of 3 PL Service Companies to 4 PL in the recession of COVID-19” was as follows:

1. Summary of the analysis of factors of change of 3PL from the opinions of the logistics service company was found that the overall level was at a high level with the mean value of 4.04. Considering each aspect, it was found that the one aspect was at the highest level: adding value in service with a lean concept. 5 areas were at a high level starting from the highest to the least: the management and cooperation, a lean concept and agility, efficiency of data communication, cost reduction, and the elimination of various problems of 3PL. These can be achieved by firms outsourcing their logistics functions to third-party logistics services providers, especially those with integrated, end-to-end solutions capabilities.

2. Analysis results about the opinion of logistics service companies towards the development of logistics management from 3PL to 4PL lean concept were found that the overall picture was at a high level with a mean of 4.13. Considering each aspect had the highest level of 3 aspects descending the order of least to most mean: leading time, development of vertical and horizontal networks, service, quality and cost respectively. Two aspects such as service and quality were at a high level. A resilient logistics sector can save lives and livelihoods. These initiatives are important first steps in the right direction. Major logistics players will have to align their efforts to build on this momentum and develop a cohesive response to the pandemic. Ambition, coordination, and innovative thinking will be critical—not just to deal with the current emergency, but also to prepare for economic recovery and sustainability.

3. Results of hypothesis testing for finding the relationship between fundamental and transformation factors of 3PL classified by type of business were found that opinions of logistics service companies with different types of businesses were not related with the 3PL change factor, lean concept with 0.05 statistical significance which rejected the hypothesis. The lean Supply chain, which relies on Just-in-Time and zero inventory management strategies, is overexposed to epidemic disruption. However, building agility is an expensive

exercise and it would be impractical for firms to completely overhaul their SCs to manage ‘black-swan’ events such as the COVID-19 pandemic.

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