Developing Improvement Strategy to Increase Logistics Service Quality and Mitigate Risks in PT. Tiga Permata Logistik and PT. Tiga Permata Ekspres

Claudia Christy Vinanda N.T, Imam Baihaqi, and Dewanti Anggrahini
Department of Industrial Engineering, Faculty of Industrial Technology, Institut Teknologi Sepuluh Nopember (ITS)
Jl. Arief Rahman Hakim, Surabaya 60111 Indonesia
e-mail: ccvinanda@gmail.com ; ibaihaqi@mb.its.ac.id

***Abstract*—As the business, trading, production are growing, the needs of 3PL are also increasing. 3PL industries are faced with the growing interest in their services, thus they have to deal with the increased competition as well. They compete to serve the best logistics service quality to attract and grab more customers. It has become a concern for 3PL or logistics service provider to improve the logistics service quality and to increase the competitiveness. Improving the logistics service quality does not only aim to get more profit, but also to engage more with the customers, to satisfy and to increase the loyalty of the customers. With this strategy, a 3PL company can be more sustain in the competition. Besides trying to increase the competitiveness by improving the logistics service quality, a 3PL company is required to run its business and provide a service in an efficient way.**

This research aims to propose strategy in increasing the logistics service quality and mitigating the risks in PT. Tiga Permata Logistik and PT. Tiga Permata Ekspres. This research applies House of Risk (HOR) in evaluating the risks or problems occurred in logistics service quality and generating the strategy required to improve the logistics service quality that will be provided by PT. Tiga Permata Logistik and PT. Tiga Permata Ekspres.

The result of HOR I and the use of Pareto concepts shows that there are 12 critical risk agents and 3 critical indicator problems to be prioritized. Based on these critical risk agents and indicator problems, the improvement strategy is developed. The result of HOR II shows that there are 28 improvement strategies that can be implemented. These strategies used to increase Logistics Service Quality (LSQ) indicator and mitigate risks that potentially occur in this company.

***Keywords*— HOR, Logistics, Risk Management, Strategy, Third Party Logistics**

I. INTRODUCTION

GLOBALIZATION has caused rapid growth of logistics activities especially transportation due to expansion of globalization market and global advanced technology that covers supply chain and [18]. ASEAN Economic Community (AEC) started on December 31st, 2015 has led to an increase of the export trade for many developing countries, one of them is Indonesia. In this globalization and AEC era, Indonesia becomes one of targeted countries to conduct a manufacturing due to several advantages. These advantages are relatively low operating cost (particularly labor and electricity) and also the large labor pool. This situation becomes a factor of the increase of demand and supply activities in Indonesia. Then it leads to the increasing logistics activities and the need of logistics and warehousing service (3PL) as well. It can be both a chance and a challenge for 3PL companies to expand their business and increase their capacity. The increasing logistics is represented in Logistic Performance Index (LPI). Indonesia's LPI score has improved by 0.14 compare to 2012, and moved up on global rank from 59 to 53 [11].

As the business, trading, production are growing, the needs of 3PL are also increasing. 3PL industries are faced with the growing interest in their services, thus they have to deal with the increased competition as well. They compete to serve the best logistics service quality to attract and grab more customers. It has become a concern for 3PL or logistics service provider to improve the logistics service quality and to increase the competitiveness. Improving the logistics service quality does not only aim to get more profit, but also to engage more with the customers, to satisfy and to increase the loyalty of the customers. With this strategy, a 3PL company can be more sustain in the competition. Besides trying to increase the competitiveness by improving the logistics service quality, a 3PL company is required to run its business and provide a service in an efficient way. Thus, the logistic cost can be reduced and the customers of a 3PL company are expected to be able to increase the selling and distribution volume.

Quality is a key requirement in every field. In terms of industrial growth, quality plays an important role either in goods manufacturing or service company. Service quality is the difference between the customers' expectation about the service and service actually received by the customer [16]. Third-party logistics as a service company also needs to improve its logistics service quality. In improving the logistics service quality, the evaluation of performance must be first done as the initial step. This evaluation process involves the listing of problems occur and logistics service quality indicators followed by analysis of the causes affecting the

problems. The problems occur are also seen as risks. Risks do not mean unpleasant things that may happen, but it refers broadly to situations where outcomes are uncertain or unexpected. After the causes are known, the strategy required in increasing the logistics service quality and mitigating the risks can be generated. This attempt of improving the logistics service quality in a 3PL company can be done by considering attributes that may affect the quality of a 3PL company.

This research aims to evaluate the service provided by 3PL companies in Surabaya, named PT. Tiga Permata Logistik and PT. Tiga Permata Ekspres. These both companies are run under the same group, which is Tiga Permata Group. PT. Tiga Permata Logistik concerns in warehousing service, while PT. Tiga Permata Ekspres concerns in expedition or distribution service. PT. Tiga Permata Logistik and PT. Tiga Permata Ekspres provide various services, which are land freight, sea freight, air freight, relocation, courier, and storage. There are some problems frequently occur, especially in expedition service, such as on-time delivery. This company has set that the on-time delivery must be 99% of all the shipments, while the fulfillment of this target is only around 74.86% of all shipments. There are still delivery process that require more than the lead time that has been set and offered by the company. It mostly occurs in LCL shipment (sea freight). In warehousing service, the problem is there are still many sudden inbound request from the customer frequently occur, thus the company is overwhelmed in providing and arranging the space in warehouse. Moreover, this research aims to propose strategy in increasing the logistics service quality and mitigating the risks in PT. Tiga Permata Logistik and PT. Tiga Permata Ekspres. This research applies House of Risk (HOR) in evaluating the risks or problems occurred in logistics service quality and generating the strategy required to improve the logistics service quality that will be provided by PT. Tiga Permata Logistik and PT. Tiga Permata Ekspres. Cause-and-Effect Diagram is also utilized in analyzing the causes of the problems occurred in logistics service quality.

II. RESEARCH METHODOLOGY

A. Observation of Company's Existing Condition

Observation of company's existing condition is done by collecting some information through direct observations and discussions with related functions. This step aims to learn the real existing condition of the object under to know the problems exist in the company, the target set by the company and its fulfillment.

B. Development of Logistics Service Quality (LSQ) Indicators and Measurement

This step consists of comparison of several case study and previous researches in related area, which is about the service quality in logistics service provider companies. Besides comparing them, it is also done through brainstorming and discussion with the manager of PT. Tiga Permata Logistik and Tiga Permata Ekspres. From these activities, the indicators or indicators in logistics service quality are obtained. The indicators should be aligned with the condition, activities carried, and processes run in these companies. It is continued by the development of LSQ measurement to know how to measure the performance of each indicator obtained previously and the factors affecting each indicator as well.

C. Measurement of Existing Logistics Service Quality (LSQ)

The next step to be done is measuring the performance of indicators in accordance with the existing condition of LSQ in PT. Tiga Permata Logistik and Tiga Permata Ekspres.

D. Data Collection of Potential Risks

This step consists of listing activity of all risks in both expedition and warehousing. The risks listed are the events or activities that usually occur and may occur in the future.

E. Determination of Critical Risk Events

The identification process of critical risk events is done in the HOR I. It is started from assigning the severity and occurrence value to each risk event through the questionnaire. Thereafter, the risks' causes are identified as well. The identification of risks' causes is done through brainstorming and discussion with the manager. The causes of every critical risk is analyzed using cause-and-effect diagram. It is then continued by determining the correlation between each risk event and each cause. The correlation, severity, and occurrence values are then multiplied to obtain ARP. The risks that have highest ARP value are then prioritized and chosen using Pareto concept. ARP value will be used as an input in HOR II.

F. Development of Improvement Strategy

In this step, there will be the determination of improvement strategy used to increase LSQ and mitigate the risks. The selected critical risks to overcome are obtained by comparing their ARP value and prioritizing based on that values. The critical risks to overcome are problems with some highest values of ARP.

G. Selection of the Best Improvement Strategy

The best alternative improvement strategy are selected to overcome each risk. Besides, the strategies are proposed to improve the service quality in logistics service provider.

H. Analysis of Improvement Strategy

The improvement strategy should be able to mitigate the risks and increase the logistics service quality in this company. This analysis process also consists of the technical details in conducting the selected improvement strategy.

I. Conclusion and Suggestion

After constructing the technical details, the conclusions of this research are made. Besides, the suggestions are also proposed to do the improvement.

III. RESULT AND DISCUSSION

A. Development of Logistics Service Quality (LSQ) Indicators

By considering the actual condition, the existing KPI, the whole processes and operations done in this company, there are six LSQ indicators which align with the aforementioned considerations. The indicators and description aligned with companies' existing condition are shown in Table 1.

Table 1.
Logistics Service Quality (LSQ) Indicator

No.	Indicator	Description
1	Lead Time	Time occurred in order processing process (inbound)
		Time occurred in material/goods unloading process, including physical checking, coloring, packaging, etc (inbound)
		Time occurred in material/goods storage (inbound)
		Time occurred in location recording process (inbound)
		Time occurred in documents preparation, until picking list created (outbound)
		Time occurred material/goods picking and checking process (outbound)
		Time occurred in documents and transportation preparation (transport)
		Time occurred in material/goods loading process (transport)
		Time occurred from receiving Return Note until transportation departure (return)
		Time occurred in material/goods checking (return)
		Time occurred in updating database (return)
		Time occurred from request arrival until documents preparation (expedition)
		Time occurred in goods loading process (expedition)
		Time occurred in delivery (expedition)
		Time occurred in POD receipt process (expedition)
2	Reliability	The ability to send POD to the customer to the due date.
		The ability to deliver orders to the due date.
3	Completeness	The ability to deliver full orders in accordance with customer's order.
4	Flexibility	The ability to handle special request or urgent orders.
5	Correctness	The ability to sustain warehouse accuracy.
		The ability to dispatch the right goods or orders.
6	Carefulness	The ability to keep goods undamaged during the whole shipping process.

B. Measurement of Existing Logistics Service Quality (LSQ)

Lead time indicator is measured based on the activities listed in Table 1. For other indicators, the measurement is developed as formulas as follow.

$$Reliability = \frac{number\ of\ POD\ sent\ to\ the\ due\ date}{number\ of\ POD\ required\ to\ the\ due\ date}\ x\ 100\% \quad (1)$$

$$Reliability = \frac{number\ of\ orders\ delivered\ to\ the\ due\ date}{number\ of\ orders\ required\ to\ the\ due\ date}\ x\ 100\% \quad (2)$$

$$Completeness = \frac{number\ of\ full\ orders\ delivered\ in\ a\ period}{total\ number\ of\ orders\ delivered\ in\ the\ same\ period}\ x\ 100\% \quad (3)$$

$$Flexibility = \frac{number\ of\ special/urgent\ orders\ confirmed\ to\ the\ customer}{number\ of\ special/urgent\ orders\ required\ by\ customer}\ x\ 100\% \quad (4)$$

$$Correctness = \frac{number\ of\ match\ lines\ in\ actual\ condition}{number\ of\ match\ lines\ recorded\ by\ system}\ x\ 100\% \quad (5)$$

$$Correctness = 100\% - \left(\frac{number\ of\ orders\ dispatched\ incorrectly\ in\ a\ period}{number\ of\ orders\ dispatched\ in\ that\ period}\ x\ 100\%\right) \quad (6)$$

$$Carefulness = \frac{number\ of\ undamaged\ orders\ during\ shipping}{total\ number\ of\ orders\ delivered\ in\ a\ period}\ x\ 100\% \quad (7)$$

C. Assessment of Logistics Service Quality (LSQ)

The achievement of LSQ indicators is shown in Table 2.

Table 2.
Existing Achievement of LSQ Indicators

(Ii)	Indicator	Factor	Achievement (%)
I1	Lead Time	Fulfillment of targeted lead time	91%
I2	Reliability	Consignment of POD to the due date	50.87%
		Orders delivery to the due date	74.86%
I3	Completeness	Full orders delivery	100%
I4	Flexibility	Confirmation and handling of special/urgent request	95.10%
I5	Correctness	Warehouse accuracy	99.10%
		Dispatch of correct goods/orders	100%
I6	Carefulness	Undamaged goods during shipping	99.57%

D. Risk Identification and Analysis

In this stage, the risks in company business process are identified s shown in Table 3.

Table 3.
Risk Event

Division	Stage	(Ei)	Risk Event
Warehouse	Inbound	E1	Insufficient space
		E2	Incomplete supporting documents
		E3	Damaged material/goods
		E4	Incorrect project color code packaging
		E5	Quantity discrepancy
		E6	Boxes are not properly labeled
		E7	Material/goods are not stored based on GRN
		E8	Incorrect put away location recording
		E9	Inaccurate inventory data entry
		E10	Delay in filling related documents after inbound process

Division	Stage	(Ei)	Risk Event
Warehouse	Outbound	E11	Incorrect picking list
		E12	Incorrect material/goods picked
		E13	Damaged material/goods
		E14	Quantity discrepancy
		E15	Delay in generating dispatch documents
		E16	Delay in sending outbound report
	Transportation	E17	Receiver cannot be contacted
		E18	Receiver/site is not ready
		E19	Incomplete/incorrect supporting documents in transport operation
		E20	Incorrect material/goods loaded to truck
		E21	Late in updating DN Tracking Report status
		E22	Incorrect shipment status
		E23	Delay in distribution
		E24	Late in submitting POD to the customer
	Return	E25	Damaged material/goods
		E26	Incorrect material or labelling checking
		E27	Late in updating material database in WMS
		E28	Incorrect update of material database
		E29	Customer dissatisfaction
Expedition	Pre-delivery	E30	Late in confirming or replying customer request
		E31	Incorrect information in Supporting documents
		E32	Error in planning the route
		E33	Error in assigning fleet
	Delivery	E34	Damaged goods
		E35	Late Delivery
		E36	Late arrival at destination
		E37	Late in updating delivery status
	Post-delivery	E38	Late in submitting documents to TA
		E39	Incomplete documents submitted to TA
		E40	Incorrect information in invoice
		E41	Late in updating the system
		E42	Customer dissatisfaction
		E43	Late payment from customer

Then, ARP value is calculated by multiplying severity of risk event and indicator, occurrence of risk agent and problem, and correlation between risk agent and risk event (1=weak correlation; 3=moderate; 9=strong) . ARP calculation is shown in (8).

$$ARP_j = O_j \sum_i S_i R_{ij} \quad (8)$$

Table 4.
Recapitulation of ARP Value

(Ai)	Risk Agent	ARP
A1	Customer does not send pre alert (sudden request)	162
A2	Unoptimized space arrangement	18
A3	Customer does not know information about required documents	315
A4	Staff carelessness	3078
A5	Human error in checking	1512
A6	Goods are not properly arranged into the truck	1620
A7	Goods are not properly packed	1890
A8	Human error in inputting data	560
A9	Staff indiscipline	2430
A10	Staffs are not responsive	1799
A11	System error	245
A12	Truck tarpaulins or box leakage	1242
A13	No coordination between customer and receiver	252
A14	Vehicle problems related to the maintenance	132
A15	Driver stops repeatedly / too often	864
A16	Force majeure	264
A17	Incorrect material information	72
A18	Lack of friendliness in customer service	594
A19	Lack of knowledge related to problem solving	765
A20	Lack of ability in handling the problem or complaint	765
A21	Staff is not stand by	36
A22	Incorrect information from customer	42
A23	Human error in marking destination	252
A24	Lack of route optimization knowledge	126
A25	Unoptimized fleet assignment	210
A26	Human error in fleet assignment	6
A27	Lack number of fleet available	288
A28	Error in planning the multidrop route	105
A29	Long queue in the port	270
A30	Overload cargo	90
A31	Change in ship departure schedule	315
A32	Airline embargo	180
A33	Transporter cannot be contacted	72
A34	Transporter is not responsive	96
A35	Lack of information about documents required	63
A36	There is no good communication between admin and customers	81
A37	Lack of information about payment	81
A38	Unclear SOP related to the payment	45

(Pi)	Problem	ARP
P1	Targeted lead time cannot be fulfilled	324
P2	POD is not sent to the due date	567
P3	Orders are not delivered to the due date	567
P4	Orders are not fully delivered	126
P5	Special/urgent request is not confirmed and handled	252
P6	Low warehouse accuracy	315
P7	Goods/orders are not sent correctly	30
P8	Goods are damaged during shipping	216

The recapitulation or ARP is shown in Table 4.

E. Development of Improvement Strategy

The improvement strategy that will be generated will focus on the prioritized risk agents and indicator problems based on the Pareto concept. There are several critical risk agents and indicator problems having highest ARP value that will be prioritized, listed in Table 5.

Table 5.
Critical Risk Agent and Indicator Problem

Aj or Pj	ARPj	Risk Agent or Indicator Problem
A4	3078	Staff carelessness
A9	2430	Staff indiscipline
A7	1890	Goods are not properly packed
A10	1799	Staffs are not responsive
A6	1620	Goods are not properly arranged into the truck
A5	1512	Human error in physical checking
A12	1242	Truck tarpaulins or box leakage
A15	864	Driver stops repeatedly / too often
A19	765	Lack of knowledge related to problem solving
A20	765	Lack of ability in handling the problem or complaint
A18	594	Lack of friendliness in customer service
P2	567	POD is not sent to the due date
P3	567	Orders are not delivered to the due date
A8	560	Human error in inputting data
P1	324	Targeted lead time cannot be fulfilled

The improvement strategy is then calculate for its effectiveness shown in (9) and difficulty of implementation (3=easy; 4=moderate; 5=hard) along with their ratio (10).

$$TE_k = \sum_j ARP_j E_{jk} \qquad \forall k \tag{9}$$

$$ETD_k = TE_k / D_k. \tag{10}$$

Table 6.
Recapitulation of Improvement Strategy Evaluation

(PAk)	Improvement Strategy	(TEk)	(Dk)	(ETDk)	Rk
PA01	The implementation of "Zero Error" principle.	85,230	3	28,410	1
PA06	Periodical evaluation.	44,406	3	14,802	2
PA04	Training to upgrade skill.	68,049	5	13,610	3
PA02	Inspection/quality control.	41,651	5	8,330	4
PA03	Reward and punishment system.	23,703	3	7,901	5
PA05	The coordinator makes plan, target, and gives directions.	23,402	3	7,801	6
PA13	Increase the standard in recruitment.	13,770	3	4,590	7
PA12	Increase the intensity of monitoring and controlling.	17,982	4	4,496	8
PA14	Periodical evaluation and simulation.	13,770	4	3,443	9
PA07	Optimization of maintenance scheduling and periodical checkup.	16,281	5	3,256	10
PA08	More selective in recruiting driver and co-driver.	7,776	3	2,592	11
PA10	Periodical direction and evaluation.	7,776	3	2,592	12
PA11	Tolerance of total stop duration.	7,776	3	2,592	13
PA26	Administration skill and ability test.	5,040	3	1,680	14
PA17	Increase the qualification standard of vendor.	5,103	4	1,276	15
PA19	Periodical evaluation with vendors.	5,103	4	1,276	16
PA20	Forecasting in air-freight and sea-freight shipment.	5,103	4	1,276	17
PA21	Order forecasting.	5,103	4	1,276	18
PA22	Lead time forecasting.	5,103	4	1,276	19
PA24	Addition and rejuvenation of vehicles.	5,103	5	1,021	20
PA25	Training for skill in planning optimization route.	5,103	5	1,021	21
PA27	Make clear and written timeline/lead time of each activity	2,916	3	972	22
PA09	Provide health insurance.	2,592	4	648	23
PA16	Re-evaluate the allocation of employee.	1,782	3	594	24
PA28	Timer system in every activity.	2,916	5	583	25
PA23	Reset delivery lead time.	1,701	3	567	26
PA15	Survey to customer.	2,125	4	531	27
PA18	Establish good relationship with vendors.	1,701	4	425	28

F. Analysis of Improvement Strategy

Based on the result of improvement strategy evaluation, there are ten strategies chosen to increase LSQ and mitigate risks. The selection of strategies based on the effectiveness in the company. These ten strategies are (PA01) The implementation of "Zero Error" principle; (PA06) Periodical evaluation; (PA04) Training to upgrade skill; (PA02) Inspection/quality control; (PA03) Reward and punishment system; (PA05) The coordinator makes plan, target, and gives directions; (PA13) Increase the standard in recruitment; (PA12) Increase the intensity of monitoring and controlling (PA14) Periodical evaluation and simulation; (PA07) Optimization of maintenance scheduling and periodical checkup.

IV. CONCLUSION

Based on the overall information presented in this research, there are some conclusions that can be concluded as follows.

1) There are six Logistics Service Quality (LSQ) indicators which align with the aforementioned considerations. These six LSQ indicators are Lead Time, Reliability, Completeness, Flexibility, Correctness, and Carefulness. Lead Time is measured from how long certain activities or processes will take to be completed. Reliability is measured from the percentage of POD returned to the due date and orders sent to the due date. Completeness is measured from the percentage of orders fully delivered. Flexibility is measured from how many the special/urgent request confirmed by the company. Correctness is measured from the percentage of warehouse accuracy and orders sent correctly. Carefulness is measured from how many damaged goods.
2) Based on the measurement of six LSQ indicators, the indicator of Completeness and Correctness in delivery have the highest achievement which is 100%. It is followed by Carefulness indicator having almost perfect value which is 99.57% and Correctness indicator in warehouse which is 99.10%. It is then followed by Flexibility indicator which is 95.10%, Lead Time 91%, then the lowest indicator which is Reliability having a value of 74.86% in delivery and 50.87% in POD return.
3) Based the calculation of Aggregate Risk Potential (ARP) and Pareto concept, there are 12 risk agents and 3 indicator problems prioritized to be improved using strategies that have been made. These risk agents are staff carelessness (A4), staff indiscipline (A9), goods are not properly packed (A7), staffs are not responsive (A10), goods are not properly arranged into the truck (A6), human error in physical checking (A5), truck tarpaulins or box leakage (A12), driver stops repeatedly / too often (A15), lack of knowledge related to problem solving (A19), lack of ability in handling the problem or complaint (A20), lack of friendliness in customer service (A18), and human error in inputting data (A8). While the critical indicator problems are POD is not sent to the due date (P2), orders are not delivered to the due date (P3), and targeted lead time cannot be fulfilled (P1)
4) There are 28 improvement strategies developed for each critical risk agent and indicator problems. From all strategies, 10 strategies are prioritized since they have highest Effectiveness to Difficulty Ratio (ETD). These 10 strategies are (PA01) The implementation of "Zero Error" principle; (PA06) Periodical evaluation; (PA04) Training to upgrade skill; (PA02) Inspection/quality control; (PA03) Reward and punishment system; (PA05) The coordinator makes plan, target, and gives directions; (PA13) Increase the standard in recruitment; (PA12) Increase the intensity of monitoring and controlling (PA14) Periodical evaluation and simulation; (PA07) Optimization of maintenance scheduling and periodical checkup.

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