MEASURING LOGISTICS PERFORMANCE (A CASE STUDY AT PT. XYZ CARGO, SURABAYA, INDONESIA)

by Dewi Dian Retno Sari

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ABSTRACT

Over the last two decades, logistics service providers have become important players in many supply chains and industries. PT. XYZ Cargo, Surabaya , one of the 3PL (third party logistics) company in Indonesia, provides air freight, sea freight, custom brokerage, logistics- supply chain management, project cargo, domestics, warehousing and distribution, and personal and industrial removal. This company realizes that it is needed to assess its logistics performance, in order to gain enhanced competitiveness, better customer care and increased profitability. Based on a literature survey, this paper attempts to develop logistics performance measurement for this company. In design the performance measurement, there are several steps: determine the company success factor (KPI), performance measurement grid, the selection of measure, audit and implementation of measures. In this research, the emphasis is on performance measures dealing with quality, cost, delivery, and flexibility in logistics based on Schoensleben's model (2004). Each criterion consists of several measured factors that are chosen from several literatures or models.

KEYWORD
Performance Measurement, Quality, Cost, Delivery, Flexibility

INTRODUCTION

The third party logistics (3PL) industry in worldwide, also in Indonesia, is currently undergoing a rapid transition. There has been considerable interest worldwide in last few years in the growth of third party logistics providers. These firms typically provide some of the following services: warehousing operations, freight payments and auditing, carrier selection and rate negotiations.

There are many 3PL companies currently operating in Indonesia, one is multinational company, PT. XYZ Cargo, which has a branch in Surabaya. This company provides services such as air freight, sea freight, customs brokerage, logistics–supply chain management, project cargo, domestics, warehouse and distribution, and removal (Personal and Industrial) and its service areas include several big cities in Indonesia such as: Jakarta, Denpasar, Semarang, Yogyakarta, Makasar, Medan, Bandung, Palembang, Pekanbaru, and other cities in Indonesia.

As a 3PL company, PT. XYZ must enhance its services to customers to face global competition through improving company's performance. To start, it is necessary to know the current company's performance by having assessment. It is needed to establish appropriate performance measures, or a set of performance measures, to determine the efficiency and/or effectiveness of an existing system. It is also used to design proposed systems, by determining the values of the decision variables that yield the most desirable levels of performance (Beamon, 1998).

PT XYZ Cargo realizes that it is needed to assess its logistics performance, in order to gain enhanced competitiveness, better customer care and increased profitability. Based on a literature survey, this paper attempts to develop logistics performance measurement for this company. It is important for the company to adopt or develop a set of suitable performance to measure the effectiveness of its logistics and supply chain system and its many interrelated components.Thus, main aim of this research is to conduct the logistics perfomance measurement in the target area of quality, delivery, cost, and flexibility.

FRAMEWORK OF LOGISTICS PERFORMANCE MEASUREMENT MODEL

The framework structure was adopted by using Medori and Steeple, 2000, that revolved five-stage plan.

1. Determine the company success factor

The main point is that company's performance measures need to be related to company's strategy and company's success factor. In this stage, the identification of company's strategy and success factor is conducted by interviewing the branch manager. In addition, literature study is performed to give input for determination of company success factor. Once of the strategic requirements of stage 1 are identified, they are then listed into the "performance measurement grid".

2. Determine priorities and develop the performance measurement grid (PMG)

In this stage, the priorities were determined based on "Integral Logistics Management" (Schoensleben, 2004; p.51), that included four competitives priorities: quality, delivery, cost, and flexibility. Table 1 consists of priorities on the vertical axis and company success factor on the horizontal axis.

TABLE 1
PERFORMANCE MEASUREMENT GRID

Area/Competitive Priority	Company Success Factor
Quality	Improve shipping quality Customer satisfaction
Cost	Reduce daily supply chain operational cost
Delivery	Achieve the delivery schedule Improve efficiency in shipping
Flexibilty	Improve the flexibity to meet the customer requirements Increase data connectivity for support daily operation

3. Selection of measures and determination of logistics performance indicator.

This stage incorporates the use of the performance measurement grid; this grid identifies the general areas, which are needed to be measured. With careful consideration, there are four target areas (quality, delivery, cost, and flexibility) to be assessed. Each area will be broken down into several performance indicator factors.
The influence of target area of quality on logistics is rather small. Some performance indicators arises from logistics itself, especially scrap factor that relates to product and customer complaint rates. Performance measurement in quality area is highly related to customer satisfaction.

Logistics performance can be assesed by measuring total logistics cost.The influence of target area of cost is significant. Logistics cost can be cost associated with assests and return on investment and total inventory cost (Gunasekaran, et al, 2001). Total cost associated with inventory consists of opportunity cost, inventory cost (incoming stock level, work in progress), service cost (stock management and insurance), cost held up as finished good in transit, risk cost, cost associated with scrap and rework, and shortage cost.

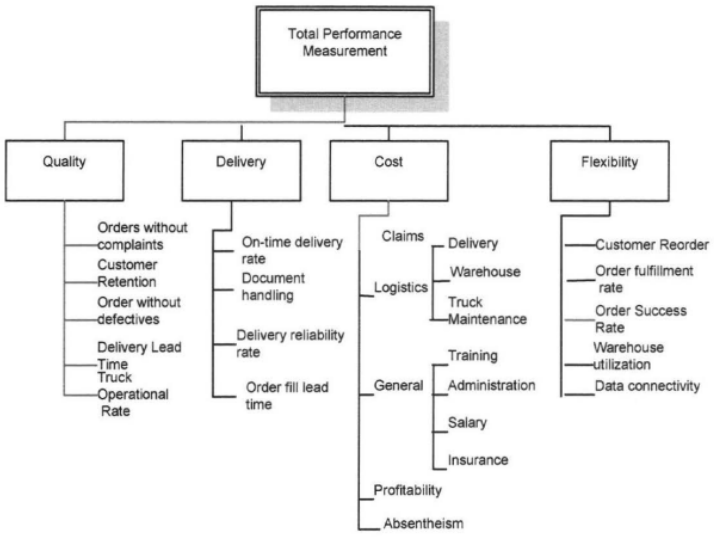
As logistics has a direct effect upon the target area of delivery, performance indicator that is related to delivery is very important. Delivery performance can be influenced by suitable delivery distribution mode, selecting suitable delivery channel, vehicle scheduling policies, and warehouse location policies. Another important factor of delivery performance is on-time delivery and it acts as a measure of customer service level. These measures are delivery-to-request date, delivery-to-commit date, and order fill lead-time.

Flexibility refers that company can make available services to meet the customer requirements. It has become possible as a result of information technology (IT) and communication system investment (Gunasekaran, et al, 2001). By defining flexibility as a metric and by assessing it, company can achieve rapid response to meet individual customer requirements.

Appropriate indicators for performance of a company are meant to show the degree to which enterprise objectives are fulfilled or not fulfilled. Logistics performance indicators are developed to analyse the effect of logistics on company objectives in four traget areas of quality, delivery, cost, and flexibility. In actual practice, the determination and measuring of logistics performance indicators are uneasy and usually require certain aspects to be counted.

The determination of logistics performance indicators are based on actual practice and benchmarking from literature study. The result shows as figure 1 and the explanation of each performance indicators is shown as Table A.1 in the attachments.

FIGURE 1
TOTAL PERFORMANCE MEASUREMENT



4. Audit

Having identified and agreed on key performance measures in stage 3, company (representative by branch manager) determine the key indicator of???

5. Implementation of measures

The first step is to determine a weight to be assigned for each key performance indicator using Analytic Hierarchy Process (AHP). Input for AHP is questionnaire filled by branch manager and logistics manager. The weighted performance indicator showns as table 2 below.

The next step is to gather data for calculating performance indicator from August 2008 to March 2009. This result can be seen as attachment table A.2. Specific for cost data, the ratio score is normalized to get performance score (%) with criterium "lower is better".

$$N_{monthi} = \frac{P_{max} - P_i}{P_{max} - P_{min}} x100 \quad \text{.....(1)}$$

P_i = Ratio for month$_i$
P_{min} = Ratio minimum
P_{max} = Ratio maximum
N_i = Performance score for month$_i$

TABLE 2
WEIGHTED PERFORMANCE INDICATOR

Performance Indicator	Weight	Performance Indicator	Weight
1. Quality (level 1):	**0,284**	3.3. General:	0,043
1.1. Orders without complaints	0,237	3.3.1. Administration Cost	0,146
1.2. Customer Retention	0,413	3.3.2. Salary	0,45
1.3. Orders without defectives	0,132	3.3.3. Insurance	0,176
1.4. Delivery Lead Time	0,147	3.3.4. Training Cost	0,229
1.5. Truck Operational Rate	0,07	3.4. Absenteeism	0,085
2. Delivery (level 1):	**0,415**	3.5. Profitability	0,252
2.1 .On-time Delivery Rate	0,245	**4. Flexibility (level 1)**	**0,213**
2.2. Document Handling	0,123	4.1. Customer Reorder Rate	0,426
2.3. Delivery Reliability Rate	0,443	4.2. Order Fulfilment Rate	0,143
2.4. Order fill Lead Time	0.189	4.3. Order Success Rate	0,271
3. Cost (level 1):	**0,089**	4.4. Warehouse Utilization	0,057
3.1. Claims	0,308	4.4. Data Connectivity	0,104
3.2. Logistics:	0,312		
3.2.1. Delivery Cost	0,217		
3.2.2. Warehouse Cost	0,642		
3.2.3. Truck Maintenance	0,142		

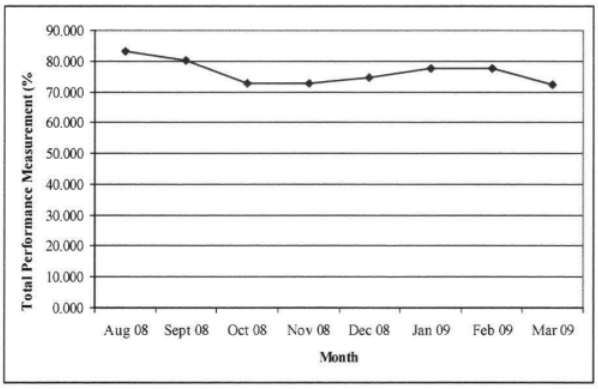
RESULT AND DISCUSSION

Total performance score is obtained by multiplying each performance indicator score by weight. The calculation of total performance measure is shown as table 3 below. Performance score ranges from 72% to 84%

TABEL 3
TOTAL PERFORMANCE MEASUREMENT

Area	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09
Quality	25,971	22,123	20,942	20,342	22,426	24,534	22,624	22,903
Delivery	38,424	37,960	37,212	38,771	36,794	35,467	37,359	33,064
Cost	6,988	8,427	4,084	5,354	4,552	6,099	5,824	5,649
Flexibility	12,012	11,839	10,635	8,229	10,803	11,611	12,047	10,676
Total	**83,396**	**80,350**	**72,873**	**72,697**	**74,574**	**77,711**	**77,853**	**72,293**

FIGURE 2
TOTAL PERFORMANCE MEASUREMENT



For further analysis, each average performance indicator score and weight is plotted as figure 3 below. Considering the range of weight (4.3% to 44.3%) and percentage of key performance score (15% to 100%), median of weight is about 20% and median of average key performance score is 80%. These medians are used as dividing line, average key performance below 80% is low and weight below 20% is low.

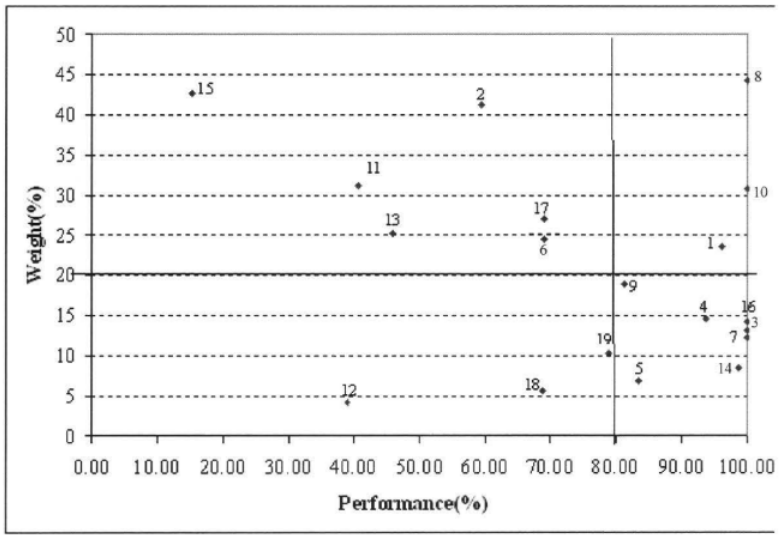
From the figure 3, it can be seen that the factors with combination of high weight and low performance, such as: customer retention (2), on-time delivery rate (6), logistics cost (11), profitability (13), customer reorder rate (15), and order success rate (17) have to be prioritised for improvement. Low customer retention and customer reorder point performance shows that some customers have low frequency of order in a month even long period of reorder. In addition, there were many loses bid positions that are shown by low order success rate performance. The delivery scheduling was poor, there were still many jobs not on-time delivered.

Orders without complaints (1), delivery reliability rate (8), and claims (10) has a good performance and high weight, company has to maintain these performances. Delivery reliability is very good, since there are no inccorect delivery (in type, quantity, and recipient) , no complaints, and no claims. No claims and no complaints indicates that company can hinder opportunity cost.

Despite their poor performances which need to be improved, general cost (12), warehouse utilization (18), and data connectivity (19) has low weight. Therefore, their improvement could be performed next after more important factors.

For orders without defectives (3), delivery time (4), Truck Operational Rate (5), document handling (7) , Order fill Lead Time (9), profitability (13), absentheism (14), and order fulfilment rate (16), their high performances should be maintained.

FIGURE 3
PERFORMANCE(%) VS WEIGHT (%)



Legend

1	Orders without complaints	6	On-time Delivery Rate	11	Logistics	16	Order Fulfilment Rate
2	Customer Retention	7	Document Handling	12	General	17	Order Success Rate
3	Orders without defectives	8	Delivery Reliability Rate	13	Profitability	18	Warehouse Utilization
4	Delivery Lead Time	9	Order fill Lead Time	14	Absentheism	19	Data Connectivity
5	Truck Operational Rate	10	Claims	15	Customer Reorder Rate		

CONCLUSSION AND SUGGESTION

From this research, the performance score is range from 72 % to 84%, and company should prioritise customer retention, logistics cost, profitability, customer reorder rate, and order success rate to be improved.

What has been conduct from this research, company needs a structured method to audit this performance measurement system continually and renew key performance indicators/measures to hinder obsolences and to enhance its measurement systems for gaining competitive advantage.

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ATTACHMENT
TABLE A.1. EXPLANATION OF PERFORMANCE INDICATOR

Area: Quality		**Area: Cost**	
Indicator 1	**Orders without complaints**	**Indicator 1**	**Claims**
Definition	Number of orders without complaint divided by total orders	Definition	Claim expenses divided by total revenue
Reason for measuring	A high complaints indicates insufficiemt service quality and leads to opportunity cost	Reason for measuring	Claims are risk cost and associated with deterioration and damage
Reference Object	process , number of deliveries	Reference Object	Item, process
Fact to measure	sub area order in a month, number of complaints in a month	Fact to measure	Number of claims, total revenue in a month
Indicator 2	**Customer Retention**	**Indicator 2**	**Warehouse Cost**
Definition	Number of customers who place order more than one in a month divided by total customers	Definition	Warehouse cost (inventory, rental cost) divided by total revenue
Reason for measuring	Customer satisfaction could drive shipper and retailer loyalty.	Reason for measuring	Efficiency in warehouse cost
Reference Object	Process, number of deliveries	Reference Object	Work centre, time period
Indicator 3	**Orders without Defectives**	**Indicator 3**	**Delivery Cost**
Definition	Orders without defectives divided by total orders	Definition	Total delivery cost divided by total revenue
Reason for measuring	A high defective items inidcates unsafe delivery rate	Reason for measuring	Efficiency in delivery cost
Reference	Number of returns, number of	Reference	Work centre, time period

Object	deliveries	Object	
Indicator 4	**Delivery Lead Time**	**Indicator 4**	**Truck Maintenance Cost**
Definition	Lateness divided by the difference between actual delivery time and standard delivery time	Definition	Total maintenance cost for all trucks divided by total revenue
Reason for measuring	Less delivery time will increase customer satisfaction. Higher delivery lead time indicates less lateness.	Reason for measuring	Maintenance cost should be kept as low as possible
Reference Object	Ordering time; standard delivery time	Reference Object	Process, time
Indicator 5	**Truck Operational Rate**	**Indicator 5**	**Administration**
Definition	Number of operational trucks per month divided by total number of trucks.	Definition	Total monthly actual administration cost divided by total revenue
Reason for measuring	A breakdown truck can hold up the delivery (quantity, time, etc)	Reason for measuring	Efficiency in administration process
Reference Object	Number of breakdown truck in a month (unit), number of trucks (unit)	Reference Object	Organizational unit, time period
Area: Delivery			
Indicator 1	**On time delivery rate**	**Indicator 6**	**Salary for Logistics Staffs**
Definition	Number of jobs with on time delivery divided by total orders	Definition	Monthly salary of logistics staffs divided by total revenue
Reason for measuring	Good delivery scheduling raises on time delivery, and reduces the opportunity cost	Reason for measuring	Efficiency in logistics process
Reference Object	Methods , delivery schedule	Reference Object	Work centre, time period
Indicator 2	**Document Handling**	**Indicator 7**	**Insurance**
Definition	Number of ordes divided by number of Receipt of Delivery Order or STTB(Surat Tanda Terima Barang)	Definition	Insurance cost divided by total revenue
Reason for measuring	To make sure that every customer order has been documented and filed in order to tracking the transcation	Reason for measuring	Insurance cost should be kept as low as possible
Reference Object	Process	Reference Object	Process, time
Indicator 3	**Delivery Reliability Rate**	**Indicator 8**	**Training**
Definition	Number of correct delivery (in quantity, recepient, type) divided by total order	Definition	Training cost divided by total revenue
Reason for measuring	Poor delivery reliability rate leads into opportunity cost, and depending	Reason for measuring	Training could enhance employees' skill to do job

Lateness (days)	Performance Score (%)
0	100
≤ 0.5	87,5
0,5-1	75
1-1.5	62,5
1,5 -2	50
2- 2.5	37,5
2.5 -3	25
3-3,5	12,5
3.5- 4	0

	on contract, penalty cost		efficienly and effectively
Reference Object	Process, item	Reference Object	Time period, work center, organizational unit
Indicator 4	**Order fill lead time**	**Indicator 9**	**Profitability**

TABLE A.2.
PERFORMANCE MEASUREMENT RESULT

Period	Aug 08	Sept 08	Oct 08	Nov 08	Dec 08	Jan 09	Feb 09	Mar 09
Orders without complaints								
Orders without complaints	89	52	40	32	61	57	48	69
Total Orders (jobs)	92	54	42	33	64	58	51	72
Performance score (%)	96.74	96.30	95.24	96.97	95.31	98.28	94.12	95.83
Customer Retention								
Customer freq. >1	19	11	9	5	15	16	12	14
Total customer/month	22	21	19	14	23	23	22	22
Performance score (%)	86.36	52.38	47.37	35.71	65.22	69.57	54.55	63.64
Orders without defectives								
Orders without defectives(kgs)	16104.8	4544.16	8394.9	4013.61	2997.53	3511.13	4152.57	3743.08
Total orders(kgs)	16104.8	4544.16	8394.9	4013.61	2997.53	3511.13	4152.57	3743.08
Performance score (%)	100	100	100	100	100	100	100	100
Delivery Lead Time								
Performance score (%)	89.4	90.09	93.45	93.18	94.61	96.34	99.5	93.75
Truck Operational Rate								
Performance score (%)	100	100	66.67	100	33.33	100	100	66.67
On-time Delivery Rate								
On-time Delivery (jobs)	85	46	32	28	39	29	31	30
Number of Orders (jobs)	92	54	42	33	64	58	51	72
Performance score (%)	92.39	85.19	76.19	84.85	60.94	50.00	60.78	41.67
Document Handling								
Total Orders (jobs)	92	54	42	33	64	58	51	72
Number of documents/STTB	92	54	42	33	64	58	51	72
Performance score (%)	100	100	100	100	100	100	100	100
Delivery Reliability Rate								
Number of correct delivery	92	54	42	33	64	58	51	72
Total Orders (jobs)	92	54	42	33	64	58	51	72
Performance score (%)	100	100	100	100	100	100	100	100
Order fill Lead Time								

Number of orders fill the standard delivery time	65	40	32	28	58	51	50	49
Total Orders (jobs)	92	54	42	33	64	58	51	72
Performance score (%)	70.65	74.07	76.19	84.85	90.63	87.9	98.04	68.06
				Claims				
Claims (Rp)	0	0	0	0	0	0	0	0
Revenue (Rp)	17,551,213	9,849,493	7,684,153	6,347,249	9,062,211	5,311,338	5,876,950	5,397,887
Ratio (in percentage)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Performance score (%)	100	100	100	100	100	100	100	100
				Delivery Cost				
Delivery (Rp)	12,285,849	6,106,685	6,070,480	4,601,755	7,068,525	3,611,710	4,113,865	3,778,521
Revenue (Rp)	17,551,213	9,849,493	7,684,153	6,347,249	9,062,211	5,311,338	5,876,950	5,397,887
Ratio (in percentage)	70	62	79	73	78	68	70	70
Performance score (%)	52.94	100.00	0.00	38.24	5.88	64.71	52.94	52.94
				Warehouse Cost				
Biaya Gudang/bln (Rp)	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
Revenue (Rp)	17,551,213	9,849,493	7,684,153	6,347,249	9,062,211	5,311,338	5,876,950	5,397,887
Ratio (in percentage)	8.55	15.23	19.52	23.63	16.55	28.24	25.52	27.79
Performance score (%)	100	66	44	23	59.35	0.00	13.80	2.30
				Truck Maintenance Cost				
Maintenance Cost (Rp)	658,000	825,000	698,750	765,000	795,000	826,750	789,650	765,250
Revenue (Rp)	17,551,213	9,849,493	7,684,153	6,347,249	9,062,211	5,311,338	5,876,950	5,397,887
Ratio (in percentage)	0.04	0.08	0.09	0.12	0.09	0.16	0.13	0.14
Performance score (%)	100.00	60.84	54.77	29.73	57.49	0.00	18.02	11.75
				Administration Cost				
Administration (Rp)	575,000	599,750	725,000	615,000	625,815	650,000	495,000	625,000
Revenue (Rp)	17,551,213	9,849,493	7,684,153	6,347,249	9,062,211	5,311,338	5,876,950	5,397,887
Ratio (in percentage)	3.28	6.09	9.44	9.69	6.91	12.24	8.42	11.58
Performance score (%)	100	68.61	31.28	28.44	59.50	0.00	42.57	7.36

				Salary				
Salary (Rp)	5,200,000	5,200,000	5,200,000	5,200,000	5,200,000	5,200,000	5,200,000	5,200,000
Revenue (Rp)	17,551,213	9,849,493	7,684,153	6,347,249	9,062,211	5,311,338	5,876,950	5,397,887
Ratio (in percentage)	29.63	52.79	67.67	81.93	57.38	97.90	88.48	96.33
Performance score (%)	100.00	66.07	44.28	23.40	59.35	0.00	13.80	2.30
				Insurance				
Insurance (Rp)	2,632,500	2,925,000	2,925,000	2,925,000	2,925,000	2,925,000	2,925,000	2,925,000
Revenue (Rp)	17,551,213	9,849,493	7,684,153	6,347,249	9,062,211	5,311,338	5,876,950	5,397,887
Ratio (in percentage)	15.00	29.70	38.07	46.08	32.28	55.07	49.77	54.19
Performance score (%)	100	63.32	42.44	22.43	56.88	0.00	13.23	2.20
				Training Cost				
Training (Rp)	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000	1,080,000
Revenue (Rp)	17,551,213	9,849,493	7,684,153	6,347,249	9,062,211	5,311,338	5,876,950	5,397,887
Ratio (in percentage)	6.15	10.97	14.05	17.02	11.92	20.33	18.38	20.01
Performance score (%)	100.00	66.07	44.28	23.40	59.35	0.00	13.80	2.30
				Profit				
Profit (Rp)	5,265,364	3,742,807	1,613,672	1,745,493	1,993,686	1,699,628	1,763,085	1,619,366
Revenue (Rp)	17,551,213	9,849,493	7,684,153	6,347,249	9,062,211	5,311,338	5,876,950	5,397,887
Ratio (in percentage)	30.00	38.00	21.00	27.50	22.00	32.00	30.00	30.00
Performance score (%)	52.94	100.00	0.00	38.24	5.88	64.71	52.94	52.94
				Absentheism				
Performance score (%)	97.35	98.99	97.88	98.89	100	100	99.49	98.48
				Customer Reorder Rate				
Performance score (%)	18.25	16.07	10.00	7.14	19.05	13.81	24.29	12.24
				Order Fulfillment Rate				
Number of fulfilled job	92	54	42	33	64	58	51	72
Total orders	92	54	42	33	64	58	51	72
Performance score (%)	100	100	100	100	100	100	100	100
				Order Success Rate				
Number of orders	92	54	42	33	64	58	51	72
Number of bids	120	62	58	90	124	66	72	105
Performance score (%)	76.67	87.10	72.41	36.67	51.61	87.88	70.83	68.57

Warehouse Utilization								
Utilized volume (m^3)	752	684	642	573	724	628	711	792
Space availability (m^3)	1000	1000	1000	1000	1000	1000	1000	1000
Performance score (%)	75.20	68.40	64.20	57.30	72.40	62.80	71.10	79.20
Data Connectivity								
Online Connection (hours)	176	126	140	126	194	114	165	156
Total working hours (hours)	198	189	180	162	198	171	198	216
Performance score (%)	88.89	66.67	77.78	77.78	97.98	66.67	83.33	72.22

MEASURING LOGISTICS PERFORMANCE (A CASE STUDY AT PT. XYZ CARGO, SURABAYA, INDONESIA)

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