

Conference Paper

Planning and Scheduling AC Product Distribution in PT. XYZ to Fulfill Service Level

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Abstract

PT. XYZ has some problems in scheduling ABC product distribution, which the company has excessive stock in the main warehouse, but stockout happened in regional warehouses. Another problem is that the company has established a 90% service level for safety stock, but it is not applied in the regional warehouse. The objectives in this research are to find out the appropriate safety stock quantity so 90% service level that company established can be achieved, to know company distribution schedule, and to count the most efficient expense that company will pay. To aim these research objectives, it started by using the Bayes method to know demand forecasting, then established safety stock quantity to fulfill 90% service level, and using DRP to scheduling company distribution activity. The results from this research are knowing safety stock quantity in the warehouse so it can fulfill 90% service level, knowing distribution schedule, and the most efficient expense that the company has to pay. According to the results, the DRP method can be used to overcome company problems and fulfill their expectation that the company has established, and estimate distribution budget.

Keywords: distribution requirement planning, safety stock, service level.

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1. Introduction

In nowadays competition, the company always have to give their best services to the customer if they want to win in the industry. To give the best service to the customer, one thing that the company should do is to make sure the product that customer wants available in the market when a customer needs it. Therefore, the company should have a good distribution system and channel to apply to the company.

According to Kotler and Keller (2011), the distribution channel is organizations that depend on the process to create products or services become available to be used or consumed. Distribution has a definition, a part that responsible for planning and controlling material flow from the supplier to the consumer with an advantage.

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Nowadays, the payment system in the economic transaction has an exponential increase in line with technological development. Technology development in the payment system has changed currency role, which known as non-cash payment that more efficient and effective. This is supported by more companies and shopping center in Indonesia that received more payment transaction used non-cash payment system. Quick, safe, comfortable, easy, and efficient in the transaction are people main reasons to non-cash payment system, and non-cash payment system has developed by the bank as payment system party in Indonesia.

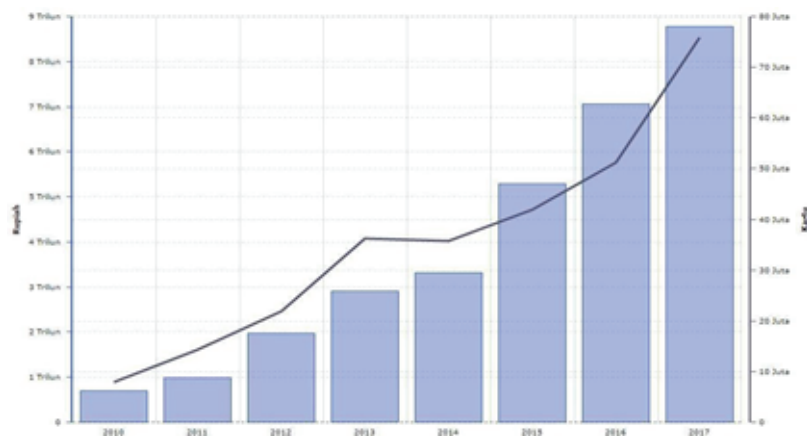


Figure 1: E-Money Transaction Graphic 2010 – Oktober 2017 (Source: www.Katadata.co.id (2017)).

According to the graphic in picture 1.1, we can see that e-money transaction 2010-October 2017 period increase 60% become Rp. 8,77 trillion from the same period in the last year. From an interview with staff in Supply Chain Division, Ms. Sisca, we know that good distribution is really important to make sure that the product distributed at the right place in the right time, but ms. Sisca explained in practice, appears some problems in distribution, as excessive stock in the main warehouse in the other hand, stock out in regional warehouses, and fluctuating demand that resists the right quantity to be distributed on time. Besides that, PT.XYZ has established service level 90% so ABC product can fulfill customer demand, but in fact, service level percentage has not achieved it, and even regional warehouse is not applied safety stock as it established by the company. Below is the information of ABC product availability in Java Region, data involve the comparison between the quantity of product available in region warehouse and demand fluctuative in Java from November 2017 – October 2018.

As we can see in table 1 that ABC product stock in Central Java region warehouse can not fulfill market demand in November 2017 – October 2018 period, its cause Central Java regional warehouse stock out and there is no safety stock to fulfil the gap, besides that we can see from data that the demand is fluctuating.

TABLE 1: ABC Product Availability Information in Central Java Region.

JATENG	Stock	Demand	Gap (Minus)
Nov-17	1700	2800	1100
Dec-17	3000	4500	1500
Jan-18	500	600	100
Feb-18	4500	10000	5500
Mar-18	5000	6000	1000
Apr-18	300	300	0
May-18	4900	9000	4100
Jun-18	3400	4000	600
Jul-18	5050	7000	1950
Aug-18	6800	10300	3500
Sep-18	15000	20000	5000
Oct-18	3200	5600	2400

Source: PT. XYZ (2018)

TABLE 2: ABC Product Availability Information in West Java Region.

JABAR	Stock	Demand	Gap (Minus)
Nov-17	500	1500	1000
Dec-17	2500	5200	2700
Jan-18	3800	4900	1100
Feb-18	2200	4000	1800
Mar-18	6800	12900	6100
Apr-18	19800	35800	16000
May-18	4400	9500	5100
Jun-18	5100	9200	4100
Jul-18	7800	15000	7200
Aug-18	12300	17100	4800
Sep-18	2000	2200	200
Oct-18	8600	13400	4800

Source: PT. XYZ (2018)

As we can see in table 1 that ABC product stock in the West Java region warehouse can not fulfill market demand in November 2017 – October 2018 period, its cause West Java regional warehouse stock out and there is no safety stock to fulfil the gap, besides that we can see from data that the demand is fluctuating.

As we can see in table 1 that ABC product stock in East Java region warehouse can not fulfill market demand in November 2017 – October 2018 period, its cause East Java regional warehouse stock out and there is no safety stock to fulfil the gap, besides that we can see from data that the demand is fluctuating.

TABLE 3: ABC Product Availability Information in East Java Region.

JATIM	Stock	Demand	Gap (Minus)
Nov-17	1000	2000	1000
Dec-17	2100	2900	800
Jan-18	3300	4750	1450
Feb-18	10500	28500	18000
Mar-18	11300	11400	100
Apr-18	800	1000	200
May-18	12200	21700	9500
Jun-18	4000	6500	2500
Jul-18	15600	27800	12200
Aug-18	11000	25500	14500
Sep-18	8900	11000	2100
Oct-18	7600	13000	5400

Source: PT. XYZ (2018)

PT. XYZ established service level 90% which means company want opportunity to fulfill market demand 90%, but as we can see in table 1.4, regional warehouse tent to re-order when the stock has been thinning out and due to no safety stock applied so that when the lead time 3 days the rest of the stock can not fulfill the needs of demand.

TABLE 4: The Rest Stock Data in Java Regional.

	JATENG	JABAR	JATIM
Nov-17	143 (51%)	110 (73, 3%)	132 (66%)
Des-17	164 (36, 4%)	190 (36, 5%)	191 (65, 9%)
Jan-18	190 (316%)	193 (39, 4%)	188 (39, 6%)
Feb-18	153 (15, 3%)	122 (30, 5%)	109 (3, 8%)
Mar-18	108 (18%)	185 (14, 3%)	164 (14, 4%)
Apr-18	101 (336%)	169 (4, 7%)	122 (122%)
Mei-18	128 (14, 2%)	135 (14, 2%)	154 (7, 1%)
Jun-18	154 (38, 5%)	142 (15, 4%)	100 (15, 4%)
Jul-18	140 (20%)	100 (6, 7%)	185 (6, 7%)
Agust-18	142 (13, 8%)	157 (9, 2%)	117 (4, 6%)
Sept-18	150 (7, 5%)	110 (50%)	137 (12, 5%)
Okt-18	176 (31, 4%)	168 (12, 5%)	163 (13, 3%)

Source: PT. XYZ (2018)

The problems in this supply chain if not be handled well will put disadvantages effect for the company in cost and profit field. Therefore, the company needs to take the right action so that this risk condition can be minimized and overcome. According to the case above, the research focus on the distribution problem that faces PT XYZ, which

the company has a problem to fulfill demand due to distribution planning, which not good.

According to Regina Steven Surya (2013), explained that DRP could become distribution minimum product solution that tends to resist, so it causes loss profit to the company. DRP can also be used to control and schedule product distribution. Chandra Sekhar J V D and Balasubramanian (2012), explained that the DRP method could be used in supply chain distribution than can result in the minimal stock to fulfill demand.

2. Research Method

Research that will use in this thesis is quantitative and descriptive. Sugiyono (2012:7), a quantitative method named traditional method because this method frequently used in research. Descriptive method inline with its name aims to describe a certain situation. According to Morris (2017), unit analysis is all things we observe to get a conclusion about all unit and to explain the difference among unit analysis. In this research unit analysis is an organization. An analysis method that used is observation and interview. Data retrieval is cross-sectional.

The variable in this research involves demand forecasting, stock control, planning, and scheduling distribution, and calculate safety stock use data source that originates from secondary company data. Data collecting technique by an interview with supply chain staff and direct observation of operational activities in PT. XYZ and work process that PT. XYZ employee does. The data analysis method used in this research is Bayes Theorem to forecasting, Calculate safety stock used service level, and scheduling ABC product distribution use DRP.

3. Result and Analysis

3.1. Safety stock 2017/2018 Calculation

Company safety stock 2017/2018 calculation uses service level method, which means the company wants only 10% probability stock unavailable in the market. From that data, we know that the service factor is 1, 28. According to data, then the calculation of safety stock for each region are:

Central Java:

Demand Mean = 13005 Pcs

Demand Standard Deviation = 10335, 78

Lead time standard deviation = $\sqrt{3/30 \times 10335, 78} = 3258,461$

Safety Stock = $1, 28 \times 3258,461 = 4188,702 = 4189$

East Java

Demand Mean = 6675

Demand Standard Deviation = 5337,028

Lead time standard deviation = $\sqrt{3/30 \times 5337,028} = 1687,716$

Safety Stock = $1, 28 \times 1687,716 = 2162,895 = 2163$

West Java

Demand Mean = 10891, 67

Demand Standard Deviation = 9392,982

Lead time standard deviation = $\sqrt{3/30 \times 9392,982} = 2970,322$

Safety Stock = $3806, 62 = 3$

TABLE 5: DRP Period November 2017 - October 2018 in Central Java by applying SS.

DRP Produk ABC Regional Jawa Tengah															
POH	100	Past Due	November 2017 - Oktober 2018												Total
Safety Stock	2163	Due	1	2	3	4	5	6	7	8	9	10	11	12	
Lot Size			1	2	3	4	5	6	7	8	9	10	11	12	
Lead Time	3 days														
Gross Requirement			2,800	4,500	600	10,000	6,000	300	9,000	4,000	7,000	10,300	20,000	5,600	
Scheduled Receipts															
Projected on Hand		100	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	
Net Requirements			2,700	4,500	600	10,000	6,000	300	9,000	4,000	7,000	10,300	20,000	5,600	
Planned Order Receipts			4,863	4,500	600	10,000	6,000	300	9,000	4,000	7,000	10,300	20,000	5,600	
Planned Order Released			4,863	4,500	600	10,000	6,000	300	9,000	4,000	7,000	10,300	20,000	5,600	
Ukuran Slot															
1 KG (Rp. 20000)			59	54	8	120	72	4	108	48	84	124	240	68 989	

Biaya Transportasi = Rp. 20.000 x 989 = Rp. 19.780.000

Biaya Pemesanan = 12 x Rp. 5.000 = Rp. 60.000

Biaya Gudang = Rp. 0

Total Biaya Pengadaan = Rp. 19.780.000 + Rp. 60.000 = Rp. 19.840.000

Setelah dilakukan perhitungan DRP dengan menerapkan SS dengan SL 90% untuk menghindari stock out pada produk ABC dari PT XYZ ke gudang regional JATENG diketahui bahwa perusahaan hanya memerlukan biaya pengadaan sebesar Rp. 19.840.000 yang berarti lebih tinggi Rp. 390.000

TABLE 6: DRP Period November 2017 - October 2018 in East Java by applying SS.

DRP Produk ABC Regional Jawa Timur															
November 2017 - Oktober 2018															
POH	100	Past Due	1	2	3	4	5	6	7	8	9	10	11	12	Total
Safety Stock	4189														
Lot Size															
Lead Time	3 days														
Gross Requirement			2,000	2,900	4,750	28,500	11,400	1,000	21,700	6,500	27,800	25,500	11,000	13,000	
Scheduled Receipts															
Projected on Hand	100		2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	2,163	
Net Requirements			1,900	2,900	4,750	28,500	11,400	1,000	21,700	6,500	27,800	25,500	11,000	13,000	
Planned Order Receipts			6,089	2,900	4,750	28,500	11,400	1,000	21,700	6,500	27,800	25,500	11,000	13,000	
Planned Order Released		6,089	2,900	4,750	28,500	11,400	1,000	21,700	6,500	27,800	25,500	11,000	13,000		
Ukuran Slot															
1 KG (Rp. 12000)			74	35	57	342	137	12	261	78	334	306	132	156	1924

Biaya Transportasi : Rp. 12.000 x 1924 = Rp. 23.088.000
 Biaya Pemesanan : 12 x Rp. 5.000 = Rp. 60.000
 Biaya Gudang : Rp. 0
 Total Biaya Pengadaan : Rp. 23.088.000 + Rp. 60.000 = Rp. 23.148.000

Setelah dilakukan perhitungan DRP dengan menerapkan SS dengan SL 90% untuk menghindari stock out pada produk ABC dari PT XYZ ke gudang regional JATIM diketahui bahwa perusahaan hanya memerlukan biaya pengadaan sebesar Rp. 23.148.000 yang berarti lebih tinggi Rp. 480.000.

TABLE 7: DRP Period November 2017 - October 2018 in West Java by applying SS.

DRP Produk ABC Regional Jawa Barat															
November 2017 - Oktober 2018															
POH	100	Past Due	1	2	3	4	5	6	7	8	9	10	11	12	Total
Safety Stock	3807														
Lot Size															
Lead Time	3 days														
Gross Requirement			1,500	5,200	4,900	4,000	12,900	35,800	9,500	9,200	15,000	17,100	2,200	13,400	
Scheduled Receipts															
Projected on Hand	100		3,807	3,807	3,807	3,807	3,807	3,807	3,807	3,807	3,807	3,807	3,807	3,807	
Net Requirements			1,400	5,200	4,900	4,000	12,900	35,800	9,500	9,200	15,000	17,100	2,200	13,400	
Planned Order Receipts			5,207	5,200	4,900	4,000	12,900	35,800	9,500	9,200	15,000	17,100	2,200	13,400	
Planned Order Released		5,207	5,200	4,900	4,000	12,900	35,800	9,500	9,200	15,000	17,100	2,200	13,400		
Weight															
1 KG (Rp. 15000)			63	63	59	48	153	430	114	111	180	206	27	161	1615

Biaya Transportasi : Rp. 15.000 x 1615 = Rp. 24.225.000
 Biaya Pemesanan : 12 x Rp. 5.000 = Rp. 60.000
 Biaya Gudang = Rp. 0
 Total Biaya Pengadaan : Rp. 24.225.000 + Rp. 60.000 = Rp. 24.285.000

Setelah dilakukan perhitungan DRP dengan menerapkan SS dengan SL 90% untuk menghindari stock out pada produk ABC dari PT XYZ ke gudang regional JABAR diketahui bahwa perusahaan hanya memerlukan biaya pengadaan sebesar Rp. 24.285.000 yang berarti lebih tinggi Rp. 450.000.

3.2. Forecasting

Data Peramalan Permintaan Periode 2018/2019

JATENG 2018/2019		JATIM 2018/2019		JABAR 2018/2019	
Bulan	Pcs	Bulan	Pcs	Bulan	Pcs
Nov-18	2753	Nov-18	1967	Nov-18	1475
Dec-18	5143	Dec-18	3028	Dec-18	5429
Jan-19	656	Jan-19	5189	Jan-19	5353
Feb-19	10694	Feb-19	30478	Feb-19	4278
Mar-19	6352	Mar-19	12068	Mar-19	13656
Apr-19	328	Apr-19	1091	Apr-19	39036
May-19	9777	May-19	23571	May-19	10319
Jun-19	4119	Jun-19	6693	Jun-19	9472
Jul-19	7598	Jul-19	30174	Jul-19	16281
Aug-19	10790	Aug-19	26714	Aug-19	17914
Sep-19	21444	Sep-19	11794	Sep-19	2359
Oct-19	6048	Oct-19	14038	Oct-19	14470
TOTAL	85702	TOTAL	166805	TOTAL	140042

Sumber: Pengolahan Data (2018)

3.3. Safety Stock 2018/2019 Calculation

Data Safety Stock Periode 2018/2019

JATENG 2018/2019		JATIM 2018/2019		JABAR 2018/2019	
Bulan		Bulan		Bulan	
Nov-18	42.59111	Nov-18	29.9044	Nov-18	22.65485
Dec-18	582.6826	Dec-18	115.9928	Dec-18	207.5184
Jan-19	50.74685	Jan-19	397.8191	Jan-19	410.5058
Feb-19	628.8985	Feb-19	1792.451	Feb-19	251.9219
Mar-19	318.9802	Mar-19	605.3375	Mar-19	685.0825
Apr-19	25.37343	Apr-19	82.46364	Apr-19	2932.443
May-19	704.1126	May-19	1695.489	May-19	742.1727
Jun-19	107.8371	Jun-19	174.8954	Jun-19	246.4847
Jul-19	541.9039	Jul-19	2151.304	Jul-19	1160.834
Aug-19	444.035	Aug-19	1100.119	Aug-19	737.6418
Sep-19	1308.544	Sep-19	719.5179	Sep-19	144.0848
Oct-19	405.9748	Oct-19	940.6292	Oct-19	969.6274

Sumber: Pengolahan Data (2018)

TABLE 8: DRP Period November 2018 - October 2019 in Central Java by Applying Safety Stock.

DRP Produk ABC Regional Jawa Timur															
POH	100	Past Due	November 2018 - Oktober 2019												Total
Safety Stock	SL		1	2	3	4	5	6	7	8	9	10	11	12	
Lot Size															
Lead Time	3 days														
Gross Requirement			1,967	3,028	5,189	30,478	12,068	1,091	23,571	6,693	30,174	26,714	11,794	14,038	
Scheduled Receipts															
Projected on Hand	100		30	116	398	1,793	606	83	1,696	175	2,152	1,101	720	941	
Net Requirements			1,867	2,998	5,073	30,080	10,275	485	23,488	4,997	29,999	24,562	10,693	13,318	
Planned Order Receipts			1,897	3,114	5,471	31,873	10,881	568	25,184	5,172	32,151	25,663	11,413	14,259	
Planned Order Released		1,897	3,114	5,471	31,873	10,881	568	25,184	5,172	32,151	25,663	11,413	14,259		
			Weight												
			23	38	66	383	131	7	303	63	386	308	137	172	2017

$ROP = (D/n) \times L = (166.805/300) \times 3 \text{ hari} = 1668 \text{ pcs}$
 Biaya Transportasi : Rp. 12.000 x 2017 = Rp. 24.204.000
 Biaya Pemesanan = 12 x Rp. 5.000 = Rp. 60.000
 Biaya Gudang = Rp. 0
 Total Biaya Pengadaan = Rp. 24.264.000

Setelah dilakukan perhitungan DRP dengan menerapkan safety stock untuk produk ABC dari PT XYZ ke gudang regional JATIM diketahui bahwa hasil ROP 1668 pcs dengan biaya transportasi yang dikeluarkan perusahaan Rp. 24.204.000, biaya pemesanan Rp.60.000 dan total biaya pengadaan ialah Rp. 24.264.000

TABLE 9: DRP Period November 2018 - October 2019 in East Java by implementing safety stock.

DRP Produk ABC Regional Jawa Tengah															
POH	100	Past Due	November 2018 - Oktober 2019												Total
Safety Stock	SL		1	2	3	4	5	6	7	8	9	10	11	12	
Lot Size															
Lead Time	3 days														
Gross Requirement			2,753	5,143	656	10,694	6,352	328	9,777	4,119	7,598	10,790	21,444	6,048	
Scheduled Receipts															
Projected on Hand	100		43	583	51	629	319	26	705	108	542	445	1,309	406	
Net Requirement			2,653	5,100	73	10,643	5,723	9	9,751	3,414	7,490	10,248	20,999	4,739	
Planned Order Receipts			2,696	5,683	124	11,272	6,042	35	10,456	3,522	8,032	10,693	22,308	5,145	
Planned Order Released		2,696	5,683	124	11,272	6,042	35	10,456	3,522	8,032	10,693	22,308	5,145		
			Weight												
			33	69	2	136	73	1	126	43	97	129	268	62	1039

$ROP = (D/n) \times L = (85.702/300) \times 3 = 857 \text{ pcs}$
 Biaya Transportasi : Rp. 20.000 x 1039 = Rp. 20.780.000
 Biaya Pemesanan : 12 x Rp.5.000 = Rp.60.000
 Biaya Gudang : Rp. 0
 Total Biaya Pengadaan : Rp. 20.840.000

Setelah dilakukan perhitungan DRP dengan menerapkan safety stock untuk produk ABC dari PT XYZ ke gudang regional JATENG diketahui bahwa hasil ROP 857 pcs dengan biaya transportasi yang dikeluarkan perusahaan Rp. 20.780.000, biaya pemesanan 60.000, dan total biaya pengadaan ialah Rp. 20.840.000

4. Conclusion

According to this research, some points of conclusion are:

1. Safety stock to 2017/2018 period for Central Java Regional 2163 pcs, East Java 4189 pcs and West Java 3807 pcs.

2. ABC product scheduling plan for 2017/2018 using DRP table can be shown in table 4.13 for Central Java, table 4.14 for East Java, and 4.14 for West Java with distribution cost:

- Central Java: Rp. 19.840.000
- East Java: Rp. 23.148.000
- West Java: Rp. 24.285.000

For advisable forecasting use Bayes Theorem

3. *Safety stock* for 2018/2019 with service level 90% as below:

4. ABC product scheduling plan for 2017/2018 using DRP table can be shown in table 4.19 for Cental Java, 4.20 for East Java, and 4.21 for East Java with distribution cost as below:

- For Central Java, cost Rp. 20.840.000, Which ROP when 857 pcs
- For East Java, cost Rp. 24.264.000, which ROP when 1668 pcs
- For West Java, cost Rp. 25.515.000, which ROP when 1400 pcs

5. Recommendation

There is some recommendation that can be company's consideration and hopefully can help the company as below:

1. PT. XYZ apply demand forecasting to calculate demand trend to ABC product. The advisable method is Bayes Theorem.
2. PT. XYZ rearrange their ABC product production and distribution system in central level to the regional level, and hopefully, the DRP method can be compony consideration to be applied.
3. The company gives more attention to safety stock, especially at the regional level, because it harms the company of stock out happened in regional while in the main warehouse there are excessive products.
4. The company applied ROP when they want to re-order the product.

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