

AN APPLICATION OF DISTRIBUTION REQUIREMENTS PLANNING (DRP) FOR PRODUCT DISTRIBUTION SCHEDULING IN A FOOD INDUSTRY COMPANY

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Abstract

This research aims to develop a product distribution schedule that meets customer demand in a timely manner while optimizing the company's total distribution costs. This research employs a quantitative descriptive approach using a case study design at PT Tom Burger Group, a fast-food company specializing in burger buns. Data were collected through direct observation, semi-structured interviews, and company documentation, including demand and inventory data over a 10-day period. The Distribution Requirements Planning (DRP) method was applied as the main analytical tool, involving demand forecasting, inventory analysis, and distribution scheduling calculations to determine optimal delivery plans and total distribution costs. The results indicate that the implementation of DRP improves the efficiency of distribution scheduling and reduces unnecessary distribution costs. Furthermore, improved planning contributes to increased customer satisfaction by ensuring timely product availability in accordance with market demand. Based on the DRP calculations, Tawar bread has the lowest total distribution cost, with 37 deliveries per year and a total cost of IDR 4,015,240. Similarly, Mini Burger, Premium Burger, and Burger bread also require 37 deliveries annually but result in different total costs due to variations in holding costs. In contrast, Jhon bread has the highest frequency of deliveries, with 111 deliveries per year and a total cost of IDR 17,804,400. The findings highlight the importance of structured, data-driven distribution planning in improving operational performance. This study is expected to support managerial decision-making in product distribution and contribute to the development of knowledge in industrial engineering, particularly in distribution planning and supply chain management.

Keywords: Breads, Distribution Cost, Distribution Planning, DRP, Food Industry



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INTRODUCTION

In the context of increasingly fierce global competition, fast food companies like PT Tom Burger Group face significant challenges in meeting growing customer demand. Limited production

capacity and inefficient distribution often lead to customer dissatisfaction (Ding et al., 2022; Sirisomboonsuk et al., 2023; Wicaksono et al., 2022). Therefore, companies must adopt a systematic approach to product distribution planning to ensure on time, sufficient product availability (Jazairy et al., 2025; Serrano-Ruiz et al., 2021).

Distribution is one aspect of marketing. Distribution can also be interpreted as a marketing activity that seeks to expedite and facilitate the delivery of goods and services from producers to consumers, so that their use is in accordance with what is needed (Alkhiyami et al., 2024; Ishii, 2022; Ningrat et al., 2023; Pramudita et al., 2025; Zhou et al., 2024).

PT Tom Burger Group is a fast-food company based in Nagari Lubuak Batingkok, Harau District, Limapuluh Kota Regency, West Sumatra Province. Currently, Tom Burger Group is a growing industry that produces various processed breads, processed meats, healthy sausages, and premium shredded meat for babies. To meet customer demand, a company naturally employs various methods to balance demand and production volume. PT Tom Burger Group once experienced problems meeting customer demand because demand exceeded daily production capacity, reaching approximately 2,379 bread requests, while only 2,200 requests could be fulfilled. Although not a significant difference, this certainly affected the company's efforts to increase profits. Good distribution planning can be one solution to overcome this problem by examining historical demand to determine when products should be distributed to meet customer demand (Abdallah et al., 2022; Kmiecik et al., 2023).

This study attempts to address this gap by offering a novel approach to product distribution scheduling planning at PT Tom Burger Group using the DRP method. The scientific innovation of this study lies in adapting the DRP method to the specific context of the Indonesian fast-food industry, while accounting for local factors such as market characteristics and consumer preferences. In doing so, this study not only contributes to the development of distribution management theory but also provides practical solutions for companies to enhance their competitiveness.

This study is significant as it addresses the practical challenge of aligning distribution planning with production capacity in the fast-food industry, where demand is highly dynamic and time-sensitive. By applying and adapting the Distribution Requirements Planning (DRP) method to this context, the study provides a structured and data-driven approach to improving distribution efficiency and reducing operational costs.

Furthermore, this research contributes to the field of industrial engineering by extending the application of DRP from general inventory planning to integrated distribution scheduling in a fast-food context. The findings offer both theoretical insights into distribution planning models and practical implications for companies seeking to enhance supply chain performance and customer satisfaction.

Despite extensive studies on the application of Distribution Requirements Planning (DRP) in improving inventory management and reducing distribution costs, limited research has focused on its application for integrated product distribution scheduling, particularly in aligning distribution plans with production capacity. Moreover, studies examining DRP implementation in the fast-food industry, especially within a local context characterized by dynamic demand and specific market conditions, remain scarce. Therefore, this study addresses these gaps by proposing an adapted DRP-based approach to optimize product distribution scheduling while considering local operational characteristics.

The problems PT Tom Burger Group faces due to a mismatch between demand and production capacity make distribution planning crucial. Therefore, the purpose of this study is to plan an effective product distribution schedule and calculate the total distribution costs required, with the hope of improving operational efficiency and customer satisfaction at PT Tom Burger Group.

Previous studies have shown that many companies have implemented various supply chain management methods to improve distribution efficiency. For example, research by Ulwanda et al. (2024) showed that implementing the Distribution Requirement Planning (DRP) method in the distribution sector can improve forecasting accuracy and inventory management efficiency. Similarly, Aulia et al. (2022) found that calculating distribution costs using the DRP method can reduce total operational costs in product procurement. Although there is extensive research on the application of DRP across industries, specific research on the implementation of DRP in fast food companies, especially in the local context, remains limited.

Distribution Requirement Planning (DRP) is a planning method for determining requirements in the distribution process, especially for maintaining stock levels of goods (Basuki, 2021; Pramono et al., 2021; Putra et al., 2024). Distribution Requirement Planning (DRP) relies on forecasting at the lowest level in the network to obtain inventory at all higher levels. Although the number of needs must be

forecasted at the local distribution level, it can also be calculated at higher levels (Prabaswari et al., 2024; Natalia et al., 2025). Distribution Requirement Planning (DRP) helps companies in planning the use of resource capacity more efficiently (Erraoui et al., 2022; Nuha et al., 2024; Tejakusuma et al., 2023). With proper scheduling, companies can ensure that distribution capacity can be adjusted to existing demand (Chen et al., 2022; Herding et al., 2023; Tong et al., 2024; Xu et al., 2022; Zhang et al., 2024). Distribution Requirement Planning (DRP) is a method for handling inventory procurement within a multi-echelon distribution network. This method uses independent demand, in which forecasting is performed to align with the procurement structure (Kulsum et al., 2020; Vicente et al., 2023). Distribution Requirement Planning functions to determine the need to replenish inventory at distribution centers (Basuki, 2024; Dai et al., 2021; Farid et al., 2021).

RESEARCH METHOD

PT Tom Burger Group faced several issues in distribution management and product scheduling that impacted operational performance and customer satisfaction. One major issue was the mismatch between demand and supply, where product demand was often not met on time due to inaccurate forecasting. Furthermore, inefficient inventory management made it difficult to control product’s production and distribution, leading to wasted resources and higher operational costs.

This study employs a quantitative descriptive research design to analyze product distribution scheduling using the Distribution Requirements Planning (DRP) method. The research focuses on analyzing demand data, inventory levels, and distribution planning to improve operational efficiency. The Distribution Requirements Planning (DRP) method was adopted due to its effectiveness in planning distribution requirements in various industries, including fast food. DRP provides a systematic framework for forecasting demand, managing inventory, and planning product delivery, thus minimizing costs while ensuring product availability.

The population in this study consists of all product demand data at PT Tom Burger Group, while the sample used is demand data for five types of bread products (Jhon, Tawar, Burger, Mini Burger, and Premium Burger) over a period of 10 days. The sampling technique applied is purposive sampling, where data is selected based on its relevance to the research objectives. The data collection technique used was primary data, collected through observations and semi-structured interviews with company staff involved in production and distribution activities. The research instruments included observation sheets, interview guidelines, and company documentation records. The data spanned 10 periods, from January 13 to 23, 2025, as shown in Table 1. The data collection technique used was primary data, collected through observations and interviews at the research site. The data spanned 10 periods, from January 13 to 23, 2025, as shown in Table 1.

Table 1. Bread Product Demand January 13 – 23, 2025

No	Date	Jhon/bks	Tawar/pcs	Burger/pcs	Mini Burger/pcs	Premium Burger/pcs
1	13	223	17	52	20	52
2	14	214	20	48	12	44
3	15	236	20	40	20	40
4	16	205	15	40	20	52
5	17	211	18	44	12	40
6	18	230	20	52	8	20
7	20	212	20	52	20	60
8	21	213	15	52	20	60
9	22	224	17	52	16	52
10	23	230	20	52	20	40

The lead time for all products is 2 days as per the policy agreed upon by PT Tom Burger Group. Inventory On Hand (IOH) data is obtained from the final inventory stock count on Thursday, January 23, 2025, as shown in Table 2.

Table 2. Inventory on Hand

No	Types of Products	IOH (pcs)
1	Jhon	480

No	Types of Products	IOH (pcs)
2	Tawar	45
3	Burger	100
4	Mini Burger	40
5	Premium Burger	60

The distribution process at PT Tom Burger Group can be seen in Figure 1 below:

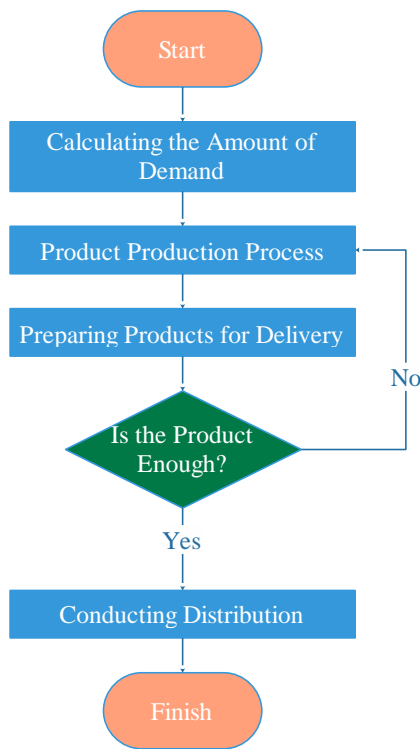


Figure 1. Distribution Process

The distribution process of PT Tom Burger Group begin with calculating the number of orders to be distributed. This is followed by the production process based on the received orders and the preparation of products for delivery. Subsequently, the products are checked to ensure they match the orders. If any shortages are identified, the product are reproduced; otherwise the products are distributed.

RESULTS AND DISCUSSION

Forecasting is carried out to find out demand data for the next 10 days which can be done using the formula in Excel software (Forecast) by linking previous data, which can be seen in Table 3.

Table 3. Bread Product Demand Forecast January 24 – February 4, 2025

No	Date	Jhon/pcs	Tawar/pcs	Burger/pcs	Mini Burger/ pcs	Premium Burger/pcs
1	24	222	18	53	18	48
2	25	223	18	56	19	50
3	27	223	18	58	18	51
4	28	229	19	59	20	52
5	29	228	18	60	21	55
6	30	228	18	60	22	56
7	31	232	18	61	21	51
8	1	232	19	63	22	53
9	3	232	18	65	22	55
10	4	233	18	66	23	58

The Economic Order Quantity (EOQ) calculation is carried out to determine the economic figures for each distribution for each type of product, using the following formula:

$$EOQ = \sqrt{\frac{2xDxS}{H}}$$

Information:

D = Annual Demand

S = Shipping Cost per Order

H = Holding Cost

The results of the Economic Order Quantity calculation are shown in Table 4.

Table 4. Economic Order Quantity Calculation Results

No	Types of Products	EOQ (pcs)
1	Jhon	755
2	Tawar	426
3	Burger	632
4	Mini Burger	453
5	Premium Burger	594

The calculation of safety stock uses the following formula:

$$Z \times \sigma dxLT$$

Information:

Z = Service Level

σ = Standar Deviation of Product Demand

d = Average Product Demand

L = Lead Time

The results of the safety stock (SS) calculation can be seen in Table 5.

Table 5. Safety Stock Calculation Results

No	Types of Products	SS (pcs)
1	Jhon	23
2	Tawar	2
3	Burger	23
4	Mini Burger	12
5	Premium Burger	17

The DRP method is used to plan distribution needs better and determine the company's total distribution costs. The total cost for each product is shown in Table 6.

Table 6. Total Cost of Each Product

No	Products	Total Cost
1	Jhon	IDR 481,200
2	Tawar	IDR 108,520
3	Burger	IDR 118,960
4	Mini Burger	IDR 109,060
5	Premium Burger	IDR 117,820

From the DRP calculation, it can be determined how many times the product must be distributed within a specified period to meet demand. The distribution plan can be seen in Table 7.

Table 7. Distribution Amount

No	Product	Distribution Amount
1	Jhon	3
2	Tawar	1
3	Burger	1
4	Mini Burger	1
5	Premium Burger	1

The calculation of Distribution Requirement Planning is as follows: PT Tom Burger Group faced several issues in distribution management and product scheduling that impacted operational performance.

Calculation of DRP Jhon

Table 7. Calculation of DRP Jhon

On Hand Balance : 480												Lead Time : 2
Safety Stock : 23												Order Quantity : 755
	Past Due	Period										
		1	2	3	4	5	6	7	8	9	10	
Gross Requirement		222	223	223	229	228	228	232	232	232	232	
Schedule Receipts												
Projected On Hand	480	258	35	567	338	110	637	405	173	696	464	
Net Requirement				211			141			82		
Planned Order Receipts				755			755			755		
Planned Order Release		755			755			755				

Inventory amount : 2,265
 Inventory cost : 2,265 x IDR 80 = IDR 181,200
 Shipping cost : 3 x IDR 100,000 = IDR 300,000
 Total cost : IDR 181,200 + IDR 300,000 = IDR 481,200

Calculation of DRP Tawar

Table 8. Calculation of DRP Tawar

On Hand Balance: 45												Lead Time: 2
Safety Stock: 2												Order Quantity: 426
	Past Due	Period										
		1	2	3	4	5	6	7	8	9	10	
Gross Requirement		18	18	18	19	18	18	18	19	18	18	
Schedule Receipts												
Projected On Hand	45	27	9	417	398	380	362	344	325	307	289	
Net Requirement				11								
Planned Order Receipts				426								
Planned Order Release		426										

Inventory amount : 426
 Inventory cost : 426 x IDR 20 = IDR 8,520
 Shipping cost : 1 x IDR 100,000 = IDR 100,000
 Total cost : IDR 8,520 + IDR 100,000 = IDR 108,520

Calculation of DRP Burger

Table 9. Calculation of DRP Burger

On Hand Balance : 100												Lead Time : 2
Safety Stock : 23												Order Quantity : 632
	Past Due	Period										
		1	2	3	4	5	6	7	8	9	10	
Gross Requirement		53	56	58	59	60	60	61	63	65	66	
Schedule Receipts												
Projected On Hand	100	47	623	565	506	446	386	325	262	197	131	
Net Requirement			32									
Planned Order Receipts			632									
Planned Order Release	632											

Inventory amount : 632
 Inventory cost : 632 x IDR 30 = IDR 18,960
 Shipping cost : 1 x IDR 100,000 = IDR 100,000
 Total cost : IDR 12,660 + IDR 100,000 = IDR 118,960

Calculation of DRP Mini Burger

Table 10. Calculation of DRP Mini Burger

On Hand Balance : 40												Lead Time : 2
Safety Stock : 12												Order Quantity : 453
	Past Due	Period										
		1	2	3	4	5	6	7	8	9	10	
Gross Requirement		18	19	18	20	21	22	21	22	22	23	
Schedule Receipts												
Projected On Hand	40	22	456	438	418	397	375	354	332	310	287	
Net Requirement			9									
Planned Order Receipts			453									
Planned Order Release	453											

Inventory amount : 453
 Inventory cost : 453 x IDR 20 = IDR 9,060
 Shipping cost : 1 x IDR 100,000 = IDR 100,000
 Total cost : IDR 9,060 + IDR 100,000 = IDR 109,060

Calculation of DRP Premium Burger

Table 11. Calculation of DRP Premium Burger

On Hand Balance : 60												Lead Time : 2
Safety Stock : 17												Order Quantity : 594
	Past Due	Period										
		1	2	3	4	5	6	7	8	9	10	
Gross Requirement		48	50	51	52	55	56	51	53	55	58	
Schedule Receipts												
Projected On Hand	60	606	556	505	453	398	342	291	238	183	125	
Net Requirement		5										
Planned Order Receipts		594										
Planned Order Release												

Inventory amount	: 594
Inventory cost	: 594 x IDR 30 = IDR 17,820
Shipping cost	: 1 x IDR 100,000 = IDR 100,000
Total cost	: IDR 17,820 + IDR 100,000 = IDR 117,820

Table 12. Optimal Decision within 10 days Each Type of Bread

Types of Bread	Jhon Bread	Tawar Bread	Burger Bread	Mini Burger Bread	Premium Burger Bread
Delivery Frequency	3x Delivery	1x Delivery	1x Delivery	1x Delivery	1x Delivery
In 10 Days	IDR 481,200	IDR 108,520	IDR 118,960	IDR 109,060	IDR 117,820

Table 12 shows that within 10 days of the calculations using DRP, the optimal decision for Jhon bread was to make three deliveries, with a total cost of IDR 481,200. For Tawar bread, the optimal decision was to make a single delivery at a total cost of IDR 108,520. For burger bread, the optimal decision was to make one delivery at a total cost of IDR 118,960. For mini burger bread, the optimal decision was to make one delivery with a total cost of IDR 109,060. For premium burger bread, the most optimal decision was to make a single delivery at a total cost of IDR 117,820.

Based on Table 12, the results of the delivery decisions and total cost calculations can be converted into years as follows:

Given:

1 year	: 365 days
Conversion in years	: 365/10 = 36.5 times or 37 times
Jhon bread	: 3 deliveries x 37 = 111 deliveries per year
Total cost of Jhon bread	: IDR 481,200 x 37 = IDR 17,804,400

For more details, please see Table 13.

Table 13. Annual Optimal Decision for Each Type of Bread

Types of Bread	Jhon Bread	Tawar Bread	Burger Bread	Mini Burger Bread	Premium Burger Bread
Delivery Frequency	111x Delivery	37x Delivery	37x Delivery	37x Delivery	37x Delivery
In 10 Days	IDR 17,804,400	IDR 4,015,240	IDR 4,401,520	IDR 4,035,220	IDR 4,359,340

Table 13 shows the total annual costs for each type of bread. Of the five types, the lowest total costs are for Tawar Bread, Mini Burger Bread, Premium Burger Bread, and Burger Bread, and the highest total cost is for John's Bread. The results of this study indicate that the application of the Distribution Requirements Planning (DRP) method is effective in improving product distribution scheduling and controlling total distribution costs at PT Tom Burger Group. The integration of forecasting, EOQ, and safety stock calculations allows the company to align inventory levels with fluctuating demand, thereby improving distribution efficiency.

Compared to previous studies, such as Ulwanda et al. (2024) and Aulia et al. (2022), which found that DRP improves inventory accuracy and reduces operational costs, this study further extends its application to the fast-food industry with short product life cycles and highly dynamic demand patterns. This demonstrates that DRP is not only applicable in general supply chain environments but also suitable for time-sensitive food distribution systems.

The findings also show that products with higher demand volume, such as Jhon bread, require more frequent deliveries and consequently incur higher total costs. In contrast, products with lower demand exhibit more stable and cost-efficient distribution patterns. This confirms that demand variability significantly influences distribution frequency and total logistics cost. From a theoretical

perspective, this study contributes to the development of distribution planning models by demonstrating the applicability of DRP in a fast-food industry context. Practically, the model provides a structured decision-making tool for optimizing delivery frequency and minimizing unnecessary distribution costs.

However, this study has several limitations. First, the analysis is based on a short-term dataset (10 days), which may not fully capture long-term demand variability. Second, external factors such as seasonality, promotions, and supply disruptions were not considered in the model. Third, the study assumes constant lead time and cost parameters, which may vary in real operational conditions. Future research is recommended to incorporate longer observation periods and integrate DRP with advanced forecasting techniques such as machine learning or time-series models. Additionally, multi-echelon distribution systems and uncertainty-based models could be explored to improve decision accuracy.

CONCLUSION

This study concludes that the application of the Distribution Requirements Planning (DRP) method effectively addresses the problem of mismatched demand and supply in product distribution scheduling at PT Tom Burger Group. The DRP approach enables more structured and data-driven distribution planning by integrating demand forecasting, inventory management, and delivery scheduling. The implementation of DRP successfully improves distribution efficiency by aligning product availability with customer demand while optimizing total distribution costs. This indicates that DRP is a suitable method for managing distribution in fast-food industry environments characterized by dynamic and fluctuating demand. From a theoretical perspective, this study contributes to the extension of DRP application by demonstrating its effectiveness in a fast-food distribution context with short product life cycles and high demand variability. Practically, the findings provide a decision-support framework for companies to improve distribution planning, reduce inefficiencies, and enhance customer satisfaction. The implications of this study suggest that companies should adopt systematic distribution planning methods such as DRP to improve operational performance and cost control. In addition, integrating demand forecasting and inventory planning into distribution decisions can significantly improve supply chain responsiveness.

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AUTHOR CONTRIBUTIONS

Author Contributions involved in this research, namely Author 1 (Team Leader): Designed the research design, formulated the background, objectives, novelty, and compiled the theoretical framework and research methodology. Led the process of data collection and validation processing. Author 2: Conducted field surveys, interviews, documentation, qualitative data analysis, and processed quantitative data. Author 3: Interpreted the results, compared the theory and research findings, and performed overall proofreading in accordance with the journal template.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

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