



Analysis of Supply Chain Risks to the Distribution of Cancer Medicine with AHP (Analytical Hierarchy Process) Methods

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A B S T R A C T

This study explores the evolving landscape of supply chain management (SCM) as a critical factor that transcends competition between individual firms and emphasizes collaboration in supply chains. In healthcare, health insurance provides a safety net against the uncertainties of life, especially cancer, the world's second leading killer. The study focuses on addressing drug delivery delays in cancer care supply chains using the Analytical Hierarchy Process (AHP) and SWOT analysis. Based on SCM concepts, medical supply chain risk management, and AHP methodology, the study uses a qualitative approach that includes data collection on anticancer drug abuse and focus group discussion (FGD). The AHP hierarchy, which emphasizes timeliness of delivery, highlights two prominent options: direct distribution to hospitals and a hybrid distribution model. A comprehensive SWOT analysis prioritizes key factors, with an emphasis on timeliness, and identifies direct marketing as the most important opportunity for hospitals, highlighting its strategic importance in optimizing the distribution of cancer drugs. The study highlights the need for timely and efficient healthcare supply chains to combat the global cancer problem.

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1. INTRODUCTION

In today's competition is no longer between one company and another, but between one Supply Chain and another, in Supply Chain there is a need for a spirit of collaboration and coordination also based on the awareness that a strong Supply Chain depending on the strength of all the elements present in it. . Supply chains need strategies to work together, coordinate, and integrate to win in the competition (Zhang et al., 2023). Health insurance can provide

guarantees for a person against risks in life, so there is no need to worry. Insurance helps people find the best treatment for their illnesses and helps overcome health complaints (Nasihardani et al., 2025). Cancer is considered one of the leading contributors to death on a global scale. Cancer is a widespread disease and poses a severe threat to individuals around the world. Unfortunately, many cases of cancer are not detected and treated until they reach an advanced stage. As a consequence of this

unfortunate reality, cancer is ranked second as the deadliest disease worldwide (Zubair et al., 2021).

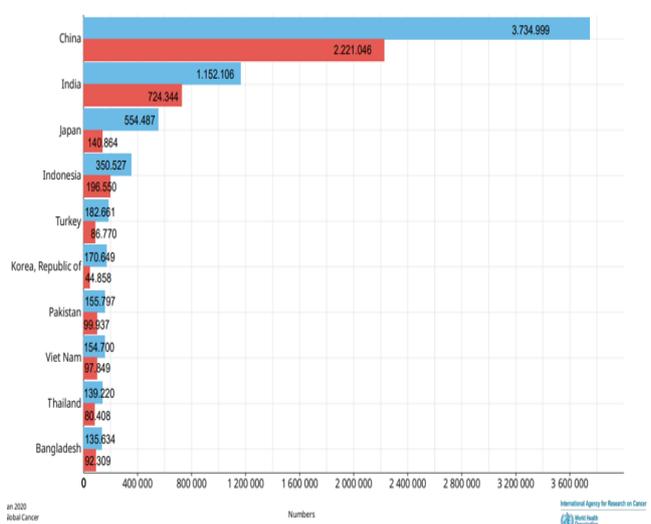


Figure 1. Number of cancer cases and deaths in Asia (Source: Globocan, 2022)

This data can be seen in Figure 1, which shows that the number of cases and deaths due to cancer in the world is still relatively high. Figure 1 shows that Indonesia occupies the fourth position in the Asian Region with the highest number of cases, 350,527 cases per 1 million population, with a total of 196,550 deaths (Christopher et al., 2025). There are eight types of cancer that most often occur in Indonesia, according to Globocan (2022). Based on the data presented in Figure 1, the highest type of cancer cases in Indonesia, with the highest percentage, is breast cancer.

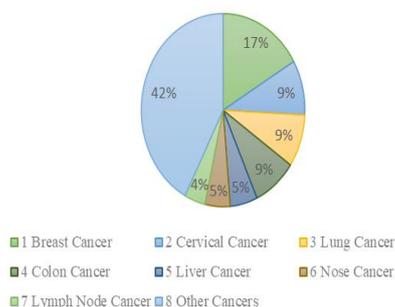


Figure 2. Types of cancer cases in Indonesia Source: Globocan (2022).

This study aims to develop preventive strategies to overcome delays in cancer drug delivery and formulate risk mitigation strategies in the supply chain by applying AHP

and SWOT methods. Analytic Hierarchy Process is an effective approach to determine the best solution in decision-making involving various criteria. This method organizes complex problems into a hierarchical structure, allowing the evaluation of alternatives in a more systematic and structured manner (Pujiyanto et al., 2025).

The selection of the AHP method in this study was based on its ability to break down complex problems into a systematic hierarchical structure. In the context of cancer drug distribution, various interrelated criteria, including timeliness, cost, supplier reliability, and supply chain resilience, require a priority-based decision-making process. AHP allows researchers to make pairwise comparisons between criteria and measure the consistency of decisions quantitatively. Thus, this method provides an objective and transparent basis for determining the optimal distribution strategy alternatives (Cebi et al., 2023).

2. LITERATURE REVIEW

To explore the concept of Supply Chain Management, it is essential to first explore what a Supply Chain is. Until now, a definite definition of Supply Chain has not yet been established. However, Hugos, in his work (2003, pages 2-3), presents several notions of Supply Chain, including: (i) According to Lambert, Stock, and Ellram, as cited by Hugos (2003, page 2), "Supply Chain is the alignment of companies that bring products or services to market." (ii) Chopra and Meindl, cited by Hugos (2003, page 2), define Supply Chain as the stages involved in meeting customer demand, either directly or indirectly. This includes manufacturers, suppliers, carriers, warehouses, retailers, and even the customers themselves. (iii) Ganeshan and Harrison, in Hugos (2003, page 3), explain that a Supply Chain is a network of facilities and distribution options that perform the functions of procuring materials, transforming those materials into intermediate and final products, and distributing final products to customers. (iv) Chopra and Meindl (2007, page 20) add that the Supply Chain is a dynamic entity involving three constant main streams: information, products, and money.

The implementation of Healthcare Supply Chain Risk Management (SCRM) in healthcare practice is still a rare topic in scientific studies. A comprehensive formal definition of supply chain risk management in the health sector is only found in the research of Senna, Reis, and colleagues (2020) (Senna et al., 2023). This definition includes identifying, evaluating, mitigating and monitoring risks in the supply chain to ensure the provision of high-quality healthcare. This involves integrating processes in the supply chain (SC), potentially reducing the risk of supply shortages, and considering human resources and clinical technical expertise (Pujawan & Geraldin, 2009). This approach recognizes that local decisions can significantly impact the trust and effectiveness of the Healthcare Supply Chain (HCSC) as it relates to SCRM and the healthcare chain as a whole. According to Teller, Kotzab, and Grant (2010), Supply Chain Management has proven to be a very effective method in increasing efficiency in specific organizations and the distribution network as a whole (Irawati & Sardjan, 2022).

An AHP is an approach, tool, or methodology developed to address, manage, and deal with complex, multifaceted, and unstructured problems (Susanto et al., 2025). This method involves drafting several available alternatives and selecting the best option using mathematical methods (Ramadhani et al., 2024). Invented by mathematician Thomas L. Saaty, AHP was designed to simplify complex problems by dividing them into smaller, easier-to-organize parts. This is done by comparing and balancing various existing criteria and priorities, as explained by Munthafa and colleagues (2018). The formula for calculating the AHP value can be determined through certain equations:

A paired comparison matrix is created for each element at the same level of the hierarchy. If there is an n element, then the size of the matrix is $n \times n$, where each a_{ij} entry expresses how important the element i is compared to the element j . The priority weight is calculated from the comparison matrix. Several methods, such as the eigenvector method, the normalization summation method, or the geometric mean method, can do this. One of the most common

ways is to find the main eigenvector of the matrix. A consistency ratio is used to check the consistency of the comparisons made.

- Calculate *Consistency Index*

$CI = (\lambda_{max} - n) / n$; n = number of elements

- Calculate the *Consistency Ratio* (CR) with the formula:

$$CR = CI / IR$$

CR = Consistency Ratio ;

CI = Consistency Index

IR = Index Random Consistency

Check the consistency of the hierarchy. If the value is more than 10%, then the data assessment. Judgment must be corrected. However, if the consistency ratio (CI/IR) is less than or equal to 0.1, the calculation results can be declared correct. After calculating the weights for all elements at each level of the hierarchy, the final decision is taken by combining these weights through the hierarchy to determine the best choice. The problem-solving framework has a flow chart structured in three different layers. At the very top, there are results from decisions that have been taken. At the second level, various evaluation criteria are applied to support different alternative solutions. Meanwhile, at the lowest level, various alternative options may be used to solve the problems faced (Senna et al., 2023).

SWOT analysis is a tool used in strategic management to evaluate the strengths, weaknesses, opportunities, and threats an organization or project faces. Identifies internal (strengths and weaknesses) and external (opportunities and threats) factors that affect the organization or project. Performs a critical evaluation of the organization or project's environment to determine the most effective strategy. Using information from SWOT analysis to make strategic decisions, plan, and overcome challenges. Create or adjust strategies based on SWOT analysis to improve the organization's or project's effectiveness and efficiency. "Super Decisions" is software used to model the AHP and Analytical Network Process (ANP), two methods often used in decision-making. Based on the literature review, it can be concluded that research on supply chain risk management in the health sector is still relatively limited, especially those

that highlight the aspect of delays in the distribution of cancer drugs in Indonesia (Wandira & Chikita, 2022). Most previous studies have focused on logistics efficiency or cost optimisation. At the same time, integrative approaches that combine risk analysis, AHP, and SWOT in the context of hospital pharmacy are still rarely found (Sembiring & Wathoni, 2021). This gap serves as the basis for the need for this research, in order to develop more measurable and applicable mitigation strategies for the national pharmaceutical industry.

3. RESEARCH METHOD

The type of research conducted can be classified as qualitative research. Qualitative research is a type of research that uses an inductive approach to analyze data. This research focuses on understanding and interpreting the meaning of data obtained through observation, interviews, and document analysis. This study took data on the use of cancer drugs from January 2022 to December 2022 and conducted a focus group discussion (FGD) with the Head of Hospital Pharmacy, Head of Drug Distributor, and Health Insurance Area Coordinator, focus group discussion (FGD) was used to describe, explain, and interpret a phenomenon that occurs in an object. The collected information becomes the foundation for the Engineering steps and data analysis process, integrated using AHP and SWOT Analysis approaches. Here is the sequence in which the process is carried out: (1) Constructing the AHP hierarchy Supply Chain Complex systems can be broken down into supporting components, arranged hierarchically, and then combined or aligned to address them, (2) Define a comparison matrix of paired criteria. This matrix determines the priority of which criteria are most important in

4. RESULT AND DISCUSSION

Based on the study's results using the Analytical Hierarchy Process (AHP) method to make a decision, "Optimization on Cancer Drug Distribution" indicates the main focus of this scheme is increasing efficiency in distributing cancer drugs. This hierarchy is divided into three aspects: Goals, Criteria and Alternatives. This diagram is divided into several main interrelated components, starting from critical aspects such as Risk Management, Cost Efficiency, Supplier Reliability, Timeliness of

decision-making, (3) Define a paired comparison matrix. An alternative tool that can help determine the alternative that best fits a predetermined criterion (Nafi'ah & Mahbubah, 2021): (i) Calculate using Super Decisions software. (ii) SWOT analysis.

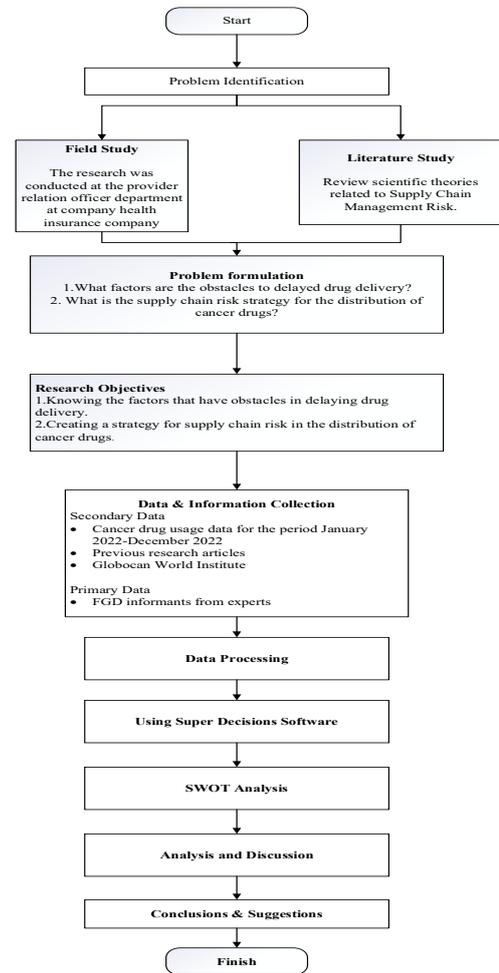


Figure 3. Research framework

Delivery, Cost, Supply Chain Resilience, and Product Quality. At a more operational level, the diagram further dissects each major factor into various strategies or more detailed approaches (Figure 4). From the AHP hierarchy, a group discussion forum was conducted on each criterion and alternative. To get the matrix comparison. In this matrix, we will compare the seven criteria and make the priorities in pairs based on their importance. Table 1 is the comparison matrix between Goals and Criteria. From the paired matrix, it

was decided that the timeliness of delivery was the highest priority of the other six criteria. The following process creates a pairwise comparison matrix between criteria and alternatives. The Pairwise Comparison Matrix Between Criteria and Alternatives is a tool that

can help to determine the alternatives that best fit the predetermined criteria. This matrix uses a ratio scale of 1 to 9. The comparison scale values used are 1,3,5,7,9. If in doubt, then take the middle value, which is 2,4,6,8. The seven matrix tables of each criterion are as follows:

Table 1. Comparison of pairs between CRITERIA

Sub indicators	Risk Management	Cost Efficiency	Supplier Reliability	Delivery Timeliness	Cost	Supply Chain Resilience	Product Quality
Risk Management	1.0	0.3	0.3	0.1	0.3	0.3	0.2
Cost Efficiency	3.0	1.0	3.0	0.3	0.3	0.3	0.3
Supplier Reliability	3.0	0.3	1.0	0.2	0.3	0.3	0.3
Delivery Timeliness	9.0	4.0	3.0	1.0	3.0	3.0	3.0
Cost	4.0	6.0	3.0	3.0	1.0	3.0	0.3
TabSupply Chain Resilience	3.0	3.0	3.0	4.0	0.3	1.0	0.3
Product Quality	6.0	6.0	3.0	3.0	3.0	3.0	1.0

(Source: data processing, 2023)

Cost Efficiency is considered slightly more important than Risk Management, therefore Cost Efficiency are given a value of 3 and Risk Management is given a scale value of 1, so that the value of the pairwise comparison coefficient between Risk Management and Cost Efficiency is 1/3 or 0.3 This value is also given to the comparison of Risk Management and Supplier Reliability. while the Delivery Timeliness is given a value of 0.2 more dominant than the Risk Management. The pairwise comparison matrix is also carried out on each paired sub-

indicator in the same way. The pairwise comparison matrix between criteria and alternatives is a tool that facilitates the process of selecting the best alternative based on predetermined criteria. This matrix utilizes Saaty's comparison scale to evaluate the relative importance of each criterion to the alternatives. Although simple, this matrix plays an effective role in supporting more precise and efficient decision making. Table 2 through Table 8 display the pairwise comparison matrix between criteria and alternatives.

Table 2. Pairwise comparison of RISK MANAGEMENT against alternatives

Sub indicators	Direct Distribution to Hospitals	Distribution Through Chain Pharmacies	Use of a Specialized Distributor	E-commerce Distribution	Hybrid Distribution Model
Direct Distribution to Hospitals	1.0	5.0	5.0	5.0	5.0
Distribution Through Chain Pharmacies	0.2	1.0	0.5	0.5	0.5
Use of a Specialized Distributor	0.2	0.2	1.0	4.0	4.0
E-commerce Distribution	0.2	0.2	0.2	1.0	1.0
Hybrid Distribution Model	0.2	2.0	2.0	2.0	1.0

(Source: data processing, 2023)

Table 3. Pairwise comparison of COST EFFICIENCY Against Alternatives

Sub indicators	Direct Distribution to Hospitals	Distribution Through Chain Pharmacies	Use of a Specialized Distributor	E-commerce Distribution	Hybrid Distribution Model
Direct Distribution to Hospitals	1.0	5.0	5.0	5.0	5.0
Distribution Through Chain Pharmacies	0.2	1.0	0.5	0.5	0.5
Use of a Specialized Distributor	0.2	0.2	1.0	4.0	4.0
E-commerce Distribution	0.2	0.2	0.2	1.0	1.0
Hybrid Distribution Model	0.2	5.0	5.0	5.0	1.0

(Source: data processing, 2023)

Table 4. Pairwise comparison of SUPPLIER RELIABILITY against alternatives

Sub indicators	Direct Distribution to Hospitals	Distribution Through Chain Pharmacies	Use of a Specialized Distributor	E-commerce Distribution	Hybrid Distribution Model
Direct Distribution to Hospitals	1.0	5.0	5.0	5.0	5.0
Distribution Through Chain Pharmacies	0.2	1.0	0.5	0.5	0.5
Use of a Specialized Distributor	0.2	0.2	1.0	4.0	4.0
E-commerce Distribution	0.2	0.2	0.2	1.0	1.0
Hybrid Distribution Model	0.2	5.0	5.0	5.0	1.0

Direct Distribution to Hospitals	1.0	4.0	3.0	4.0	5.0
Distribution Through Chain Pharmacies	0.3	1.0	0.2	1.0	0.5
Use of a Specialized Distributor	0.3	0.3	1.0	3.0	3.0
E-commerce Distribution	0.3	0.3	0.2	1.0	0.3
Hybrid Distribution Model	0.2	0.2	1.0	2.0	1.0

(Source: data processing, 2023)

Table 5. Pairwise comparison of TIMELINESS OF DELIVERY against alternatives

Sub indicators	Direct Distribution to Hospitals	Distribution Through Chain Pharmacies	Use of a Specialized Distributor	E-commerce Distribution	Hybrid Distribution Model
Direct Distribution to Hospitals	1.0	3.0	4.0	4.0	4.0
Distribution Through Chain Pharmacies	0.3	1.0	0.5	0.5	0.3
Use of a Specialized Distributor	0.3	0.3	1.0	2.0	0.3
E-commerce Distribution	0.3	0.3	0.3	1.0	0.5
Hybrid Distribution Model	0.3	5.0	5.0	3.0	1.0

(Source: data processing, 2023)

Table 6. Pairwise comparison of COST against alternatives

Sub indicators	Direct Distribution to Hospitals	Distribution Through Chain Pharmacies	Use of a Specialized Distributor	E-commerce Distribution	Hybrid Distribution Model
Direct Distribution to Hospitals	1.0	3.0	5.0	4.0	4.0
Distribution Through Chain Pharmacies	0.3	1.0	0.5	0.3	0.5
Use of a Specialized Distributor	0.2	0.2	1.0	0.5	2.0
E-commerce Distribution	0.3	0.3	0.3	1.0	4.0
Hybrid Distribution Model	0.3	2.0	4.0	2.0	1.0

(Source: data processing, 2023)

Table 7. Pairwise comparison of SUPPLY CHAIN RESILIENCE to alternatives

Sub indicators	Direct Distribution to Hospitals	Distribution Through Chain Pharmacies	Use of a Specialized Distributor	E-commerce Distribution	Hybrid Distribution Model
Direct Distribution to Hospitals	1.0	5.0	4.0	3.0	4.0
Distribution Through Chain Pharmacies	0.2	1.0	0.3	0.3	0.3
Use of a Specialized Distributor	0.3	0.3	1.0	2.0	3.0
E-commerce Distribution	0.3	0.3	0.3	1.0	3.0
Hybrid Distribution Model	0.3	3.0	3.0	3.0	1.0

(Source: Data Processing, 2023)

Table 8. Pairwise comparison of PRODUCTION QUALITY against alternatives

Sub indicators	Direct Distribution to Hospitals	Distribution Through Chain Pharmacies	Use of a Specialized Distributor	E-commerce Distribution	Hybrid Distribution Model
Direct Distribution to Hospitals	1.0	4.0	4.0	4.0	4.0
Distribution Through Chain Pharmacies	0.3	1.0	0.3	3.0	0.3
Use of a Specialized Distributor	0.3	0.3	1.0	3.0	0.5
E-commerce Distribution	0.3	0.3	0.3	1.0	0.3
Hybrid Distribution Model	0.3	3.0	0.3	3.0	1.0

(Source: Data Processing, 2023)

After calculating with the matrix, the researcher inputs focus group discussion (FGD) data using the help of Super Decisions software. Where to get two results: pairwise comparisons between criteria and paired comparisons between alternatives. It can be seen in Figure 5 that there is a paired graph between goals and criteria; in the figure, the most critical level of importance

is 36% for timeliness of delivery and 3% for risk management.

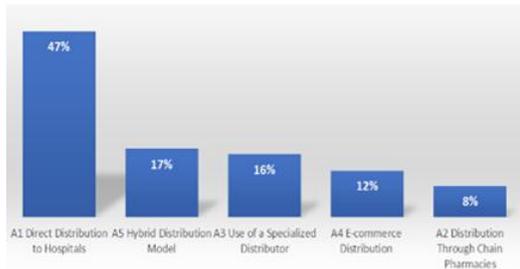


Figure 4. Pairing graph between criteria and alternatives

In Figure 4, the comparison graph between criteria and alternatives shows that the alternative with the highest priority is Direct Distribution to Hospitals as much as 47%, this value is obtained from the normalised average

value of all pairwise comparison alternatives. All pairwise comparison alternatives also show inconsistency values below 0.1. In contrast, the lowest priority alternative is Distribution through the pharmacy network, with a total weight of 8%. Based on the normalization results, there are two main alternatives that can be chosen: Direct Distribution to Hospitals and Hybrid Distribution Model. Both strategies are designed to ensure effective and efficient distribution of cancer medicine. The next step is to conduct a SWOT analysis to assess the weight of each aspect, such as strengths, weaknesses, opportunities, and threats, so that the comparison and benefits can be evaluated in Table 9 and 10.



Figure 5. Pairing chart between goals and criteria

Table 9. SWOT analysis on direct distribution alternatives to hospitals

Category	Factor	Urgency	Category	Factor	Urgency
Strengths	1. Better control over the supply chain.	2	Weaknesses	1. High logistics costs.	4
	2. Reduction of delivery time.	4		2. Complexity in management.	1
	3. Lower risk of damage and loss.	1		3. Geographical range limitations.	3
	4. Establishment of direct relations with hospitals.	3		4. The need for unique infrastructure.	2
Opportunities	1. Increasing demand for fast delivery.	4	Threats	1. Changes in government regulations.	4
	2. Adoption of innovative technologies.	1		2. Competition with large distributors.	3
	3. Range expansion.	3		3. Risk of supply chain disruption.	4
	4. Partnership with local suppliers.	2		4. Compliance and security issues.	2

(Source: data processing, 2023)

Table 10. SWOT analysis of hybrid distribution model alternatives

Category	Factor	Urgency	Category	Factor	Urgency
Strengths	1. Greater flexibility in managing supply chains.	2	Weaknesses	1. Potential conflicts or inefficiencies in coordination between various distribution channels.	4
	2. Ability to achieve a wide geographical range.	4		2. Profit margins that may be lower due to involving third parties.	2

Category	Factor	Urgency	Category	Factor	Urgency
Opportunities	3. Reduction of heavy logistics and management burden.	1	Threats	3. Reliance on third parties may affect Distribution's consistency and reliability.	3
	4. Leverage existing expertise and networks from distributors.	3		4. Complexity in managing relationships with various parties.	1
	1. Ability to adapt to market changes or customer needs more quickly.	4		1. Changes in policies and regulations that may affect the distribution model.	1
	2. The potential to combine direct and indirect distribution forces.	2		2. Competition from other distribution methods that may be more efficient or low cost.	2
	3. Opportunity to increase market reach and penetration.	1		3. Risk of supply chain disruption due to external factors such as natural disasters or political changes.	4
	4. Strategic partnerships with various parties to expand distribution networks.	3		4. Challenges in maintaining product quality and safety during more complex distribution processes.	3

(Source: data processing, 2023)

The SWOT Analysis Table on Alternatives of Direct Distribution to Hospitals and Hybrid Distribution Model above outlines a number of factors with a level of urgency (scale 1-5) that need to be considered in the next stage of the SWOT analysis. This stage aims to determine the weights that will be used in calculating the value of each factor in the category. By understanding the strengths, weaknesses, opportunities and threats associated with this

distribution model, healthcare organizations can make more informed decisions to reduce delays in cancer drug distribution. The next step is to assign a value to each category using a scale of 1 to 5. The final results for each category are shown in Table 11 and 12, which present the weights and values from the SWOT Analysis of the Direct-to-Hospital Distribution Alternative and the Hybrid Distribution Model.

Table 11. SWOT analysis of the direct to hospital distribution alternative

Category	Factor	Urgency	Weight	Ratings	Score	Category	Factor	Urgency	Weight	Ratings	Score
Strengths	S1: Better control over the supply chain.	2	0.10	2	0.20	Weaknesses	W1 : High logistics costs.	4	0.20	4	0.80
	S2: Reduction in delivery time.	4	0.20	5	1.00		W2:Complexity in management.	1	0.05	2	0.10
	S3: Lower risk of damage and loss.	1	0.05	2	0.10		W3: Limited geographical coverage.	3	0.15	4	0.60
	S4: Establishment of a direct relationship with the hospital.	3	0.15	4	0.60		W4: Need for specialized infrastructure.	2	0.10	2	0.20
Opportunities	O1: Increased demand for fast delivery.	4	0.17	5	0.87	Threats	T1: Changes in government regulations.	4	0.17	4	0.70
	O2: Adoption of innovative technologies.	1	0.04	2	0.09		T2:Competition with large distributors.	3	0.13	2	0.26
	O3: Expansion of reach.	3	0.13	4	0.52		T3: Risk of supply chain disruption.	4	0.17	5	0.87
	O4: Partnership with local suppliers.	2	0.09	2	0.17		T4: Compliance and security issues.	2	0.09	1	0.09

Table 12. SWOT analysis of hybrid distribution model

Category	Factor	Urgency	Weight	Ratings	Score	Category	Factor	Urgency	Weight	Ratings	Score
Strengths	S1: Greater flexibility in managing the supply chain.	2	0.10	2	0.20	Weaknesses	W1: Potential conflicts or inefficiencies in coordination between various	4	0.20	4	0.80

Category	Factor	Urgency	Weight	Ratings	Score	Category	Factor	Urgency	Weight	Ratings	Score
							distribution channels.				
	S2: Ability to achieve a wide geographical reach.	4	0.20	5	1.00		W2: Possibly lower profit margins due to the involvement of third parties.	2	0.10	2	0.20
	S3: Reduction of heavy logistics and management burden.	1	0.05	2	0.10		W3: Dependence on third parties that may affect the consistency and reliability of distribution.	3	0.15	4	0.60
	S4: Utilizing the expertise and existing network of the distributor.	3	0.15	4	0.60		W4: Complexity in managing relationships with various parties.	1	0.05	2	0.10
	O1: Ability to adapt to changes in the market or customer needs more quickly.	4	0.17	5	0.87		T1 : Changes in policies and regulations that may affect the distribution model.	1	0.04	2	0.09
	O2: Potential to combine the strengths of direct and indirect distribution.	2	0.09	3	0.26		T2: Competition from other distribution methods that may be more efficient or lower cost.	2	0.09	2	0.17
Opportunities	O3: Opportunity to increase market reach and penetration.	1	0.04	2	0.09	Threats	T3: Risk of supply chain disruption due to external factors such as natural disasters or political changes.	4	0.17	5	0.87
	O4: Strategic partnerships with various parties to expand distribution network.	3	0.13	4	0.52		T4: Challenges in maintaining product quality and safety during more complex distribution processes.	3	0.13	4	0.52

Based on the calculations presented in Table 11 and 12 and the results of consultations with experts, the researchers analyzed the scores of internal factors (Strengths-Weaknesses) and external factors (Opportunities-Threats) listed in the tables. The results of the analysis of these positions can be found in Tables 13 to 20.

Table 13. Strengths position analysis direct distribution to hospitals

No	Factor	Urgency	Weight	Ratings	Score
1	Strengths 1	2	0.10	2	0.20
2	Strengths 2	4	0.20	5	1.00
3	Strengths 3	1	0.05	2	0.10
4	Strengths 4	3	0.15	4	0.60
Amount					1.90

Table 14. Weaknesses position analysis direct distribution to hospitals

No	Factor	Urgency	Weight	Ratings	Score
1	Weaknesses 1	4	0.20	4	0.80

2	Weaknesses 2	1	0.05	2	0.10
3	Weaknesses 3	3	0.15	4	0.60
4	Weaknesses 4	2	0.10	2	0.20
Amount					1.70

Based on the calculations listed in the tables above, a subtraction process from 1.90 - 1.70 was carried out, resulting in a result of 0.20. Next, the external factor scores were calculated, with the results found in Table 15 and 16.

Table 15. Opportunities position analysis direct distribution to hospital

No	Factor	Urgency	Weight	Ratings	Score
1	Opportunities 1	4	0.17	5	0.87
2	Opportunities 2	1	0.04	2	0.09
3	Opportunities 3	3	0.13	4	0.52
4	Opportunities 4	2	0.09	2	0.17
Amount					1.65

Table 16. Threats position analysis direct distribution to hospitals

No	Factor	Urgency	Weight	Ratings	Score
1	Threats	4	0.17	4	0.70
2	Threats	3	0.13	2	0.26
3	Threats	4	0.17	5	0.87
4	Threats	2	0.09	1	0.09
Amount					1.91

Tables 15 and 16 present the Total Opportunities value of 1.65 and the Total Threats value of 1.91, resulting in a position of -0.26. Next, the position analysis calculations relating to the Hybrid Distribution Model were carried out, as shown in Tables 17 to 20.

Table 17. Strengths position analysis hybrid distribution model

No	Factor	Urgency	Weight	Ratings	Score
1	Strengths 1	2	0.10	3	0.30
2	Strengths 2	4	0.20	5	1.00
3	Strengths 3	1	0.05	2	0.10
4	Strengths 4	3	0.15	4	0.60
Amount					2.00

Table 18. Weaknesses position analysis hybrid distribution model

No	Factor	Urgency	Weight	Ratings	Score
1	Weaknesses 1	4	0.20	4	0.80
2	Weaknesses 2	2	0.10	2	0.20
3	Weaknesses 3	3	0.15	4	0.60
4	Weaknesses 4	1	0.05	2	0.10
Amount					1.70

Tables 17 and 18 show that the total strength score is 2.00, while the total weakness score is 1.70. The difference between these two values is 0.30, which represents the position on the X-axis as an internal factor. Meanwhile, in Tables 19 and 20, the total opportunity score was recorded at 1.74, while the total threat score was 1.65. The difference between these two values is 0.09, which represents the position on the Y-axis as external factors.

Table 19. Opportunities position analysis hybrid distribution model

No	Factor	Urgency	Weight	Ratings	Score
1	Opportunities 1	4	0.17	5	0.87
2	Opportunities 2	2	0.09	3	0.26
3	Opportunities 3	1	0.04	2	0.09
4	Opportunities 4	3	0.13	4	0.52
Amount					1.74

Table 20. Opportunities position analysis hybrid distribution model

No	Factor	Urgency	Weight	Ratings	Score
1	Threats 1	1	0.04	2	0.09
2	Threats 2	2	0.09	2	0.17
3	Threats 3	4	0.17	5	0.87
4	Threats 4	3	0.13	4	0.52
Amount					1.65

Based on the results of the analysis of alternative positions presented in the tables above, a Cartesian diagram can be prepared, with details shown in the diagram below (Figure 7).

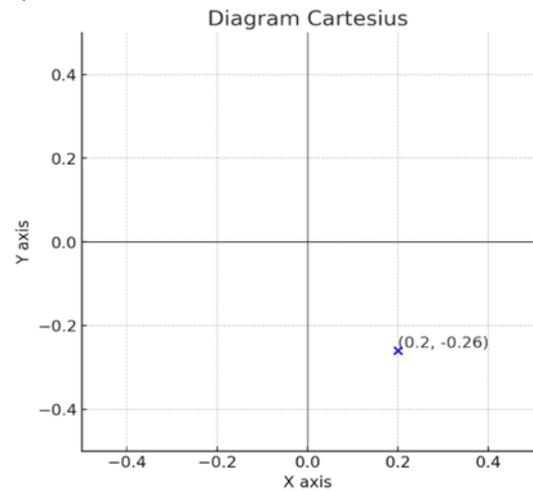


Figure 6. Cartesius diagram SWOT analysis on alternative direct to-hospital distribution model

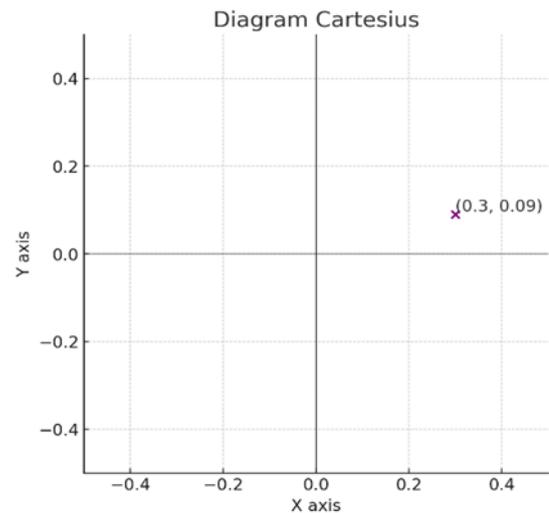


Figure 7. Cartesius diagram SWOT Analysis on Hybrid Distribution Model Alternatives

Based on Tables 13 to 16, the Cartesian diagram shows that the Direct Distribution Analysis to Hospitals is at coordinates X = 0.20 and Y = -0.26. This point is in Quadrant IV (X Positive, Y Negative), which indicates that strengths are more dominant than weaknesses, although there are limited opportunities for improvement. Suggested strategies include optimizing advantages, mitigating risks, improving operational efficiency, utilizing technology, and

strengthening strategic partnerships to ensure more effective and sustainable distribution.

Based on Figure 7, the analysis results show that the Hybrid Distribution Model is at coordinates $X = 0.17$ and $Y = 0.39$, located in Quadrant I. This position indicates weaknesses that need to be addressed, but is also supported by significant strengths and opportunities for improvement. This position indicates weaknesses that need to be addressed, but is also supported by significant strengths and opportunities for improvement. With positive trends in the aspects of strengths and opportunities, the strategies implemented can be focused on optimizing these potentials to minimize delays in the distribution of cancer medication.

Based on the data processing results, it can be seen that the comparison matrix between goals and criteria gets the decision that "Timeliness of delivery" is the most important thing than "Risk Management, Cost Efficiency, Supplier Reliability, supply chain resilience and Quality". As seen in the normalization results, using the help of Super Decision software "Timeliness of Delivery," a normalization value of 0.35628 or 36% was obtained with a consistency value below 10%. From these results, the timeliness of delivery is very crucial and must be applied because the timeliness of delivery in supply chain management is a critical aspect that is often a top priority in many industries.

The results of the study in the comparison matrix section between criteria and alternatives which have seven criteria and five alternatives. Deciding that "Direct Distribution to Hospitals" is the most important thing to speed up the cancer drug distribution process. The results of using the help of Super Decision software get the highest normalization value of 0.470099 or if made in a percentage of 47% with a consistency value below 10%. The second highest normalization value is the Hybrid Distribution Model with a value of 0.173170 or if it is a percentage of 17% with a consistency value below 10% for the third normalization value is the Use of Specialist Distributors with a value of 0.159694 with a percentage of 16% with a consistency value below 10%. The fourth

normalization value is Distribution Through E-Commerce with a normalization value of 0.117645 with a percentage value of 12% with a consistency value below 10%, and the fifth normalization value is Distribution through pharmacy chains gets a normalization value of 0.079392 if the percentage is made at 8% with a consistency value below 10%.

The second highest alternative is the Hybrid Distribution Model placed in Quadrant I, which is a meeting between strength and opportunity, utilizing the strengths possessed to seize existing opportunities. From the analysis conducted, it was revealed that the most crucial timeliness of cancer drug distribution delivery occurred at insurance company partner hospitals, which had a percentage of 36% and the lowest percentage or could be categorized as not a priority in a decision in optimizing cancer drug distribution was risk management with a total percentage of 3%. The Analytical Hierarchy Process (AHP) method in identifying the timeliness of delivery in optimizing the Distribution of cancer drugs shows that the risk is the highest or most priority.

The timeliness of delivery in the Distribution of cancer drugs has significant financial implications. Delays often result in additional costs, such as storage costs, emergency shipping costs, or even contractual fines between distributors and insurance companies for exceeding the predetermined time of delivery of drugs to hospitals between the insurance company and the distributor. In addition, the alternative with the highest percentage in optimizing the Distribution of cancer drugs is Direct Distribution to Hospitals, with a percentage of 47%, and the lowest percentage is Distribution Through Pharmacy Chains at 8%. The Analytical Hierarchy Process (AHP) method in identifying Direct Distribution to Hospitals in optimizing the Distribution of cancer drugs shows the best or most priority alternatives. After a SWOT Analysis of the first two highest alternatives in the Direct Distribution to Hospital alternative occupies a position in quadrant IV where the suggested strategy for the Direct Distribution to Hospital approach involves utilizing existing deficiencies to deal with various challenges in achieving the targeted goals. While the second

highest alternative in the Hybrid Distribution Model has a placement in Quadrant I, the recommended strategy for the Hybrid Distribution Model is to prioritize using existing advantages as an approach to overcome various opportunities to achieve goals. This shows that the first alternative strategy is most effective in optimizing the Distribution of cancer drugs to insurance participants.

The results of this study can be utilised by the pharmaceutical industry, hospitals, and distribution companies to improve the distribution model for cancer drugs more effectively. The alternatives recommended through AHP, namely direct distribution to hospitals and a hybrid distribution model, can serve as strategic guidelines for reducing delivery times and minimising the risk of delays. Additionally, the SWOT results provide practical guidance in determining investment priorities, strengthening partnerships, and managing operational risks to make the drug distribution system more resilient and responsive to market demand and health emergencies.

5. CONCLUSION

Optimization of the distribution of cancer drugs based on seven evaluation criteria shows that Timeliness of Delivery is the most critical factor influencing distribution performance to private hospitals in Jakarta that collaborate with insurance companies, as delays directly impact insurance participants who require timely treatment. The initial SWOT analysis indicates that the Direct Distribution to Hospitals alternative is positioned in Quadrant IV, suggesting a strategy that focuses on addressing identified weaknesses to overcome existing challenges and achieve the targeted objectives. Meanwhile, the Hybrid Distribution Model, which ranks as the second-best alternative, is located in Quadrant I, where the recommended approach emphasizes leveraging existing strengths to take advantage of available opportunities in order to reach the desired goals. Future research is recommended to incorporate broader quantitative approaches, such as Fuzzy AHP or ANP, to better capture uncertainty in expert assessments. In addition, subsequent studies could expand the scope to other categories of pharmaceuticals or conduct

deeper analysis on cold chain logistics stages for temperature-sensitive drugs. The integration of real-time data from digital supply chain systems is also expected to enhance the validity of findings and provide a more dynamic overview of the effectiveness of implemented distribution strategies.

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