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Applying the Combination of AHP and WPM Methods to Prioritize Pharmaceutical Distribution Channel Selection

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Abstract

Purpose: This study was conducted to identify and prioritize the distribution channel choices of pharmaceutical businesses in Vietnam. **Research design, data, and methodology:** To achieve the above objectives, the research team applied a combination of two analytical methods: Analytical Hierarchy Process (AHP) and Weighted Multiplier Model (WPM). First, the criteria for evaluating distribution channels were determined through group discussions with leading experts in the pharmaceutical distribution field. Next, AHP was used to calculate the relative weight of each criterion, helping to clarify the level of influence they exert when deciding to choose a distribution channel. Finally, the WPM model was applied to rank the options based on the determined weights, helping to provide a clear and reasonable order of priority. **Results:** The analysis results show that the priority ratio between distribution channel options has clear differences, specifically: $P(A1/A2) = 1.0035$; $P(A2/A4) = 1.0160$; $P(A4/A5) = 1.0295$; and $P(A3/A5) = 0.7396$. These numbers represent the relative priority between channels, thereby determining the optimal choice order for businesses. **Conclusions:** The study concluded that the ETC distribution channel is considered the top priority, followed by the OTC channel, then the social media channel, the television channel, and finally the website distribution channel. This result indicates that pharmaceutical companies are prioritizing modern channels that enable them to reach consumers more quickly and effectively.

Keywords : AHP, WPM, Strategy, Select Distribution Channel, Pharmaceuticals, Vietnam

JEL Classification Code: M10, B16, D30

1. Introduction

The pharmaceutical industry in Vietnam is developing strongly, with an average growth rate of about 10%/year in the period 2016-2022, the Vietnamese pharmaceutical market is valued at about 6.2-6.4 billion USD/year, forecast to reach 16.1 billion USD by 2026 (Nguyen et al., 2024). As of 2023, Vietnam has about 51 foreign-invested

pharmaceutical manufacturing enterprises and 228 domestic pharmaceutical manufacturing enterprises. Of which, 18 enterprises meet high GMP standards like the EU. On the other hand, Vietnam's young population structure is aging rapidly; environmental pollution and the level of concern of over 100 million people about health issues are increasing (Nguyen et al., 2022). This issue will be the driving force for the pharmaceutical industry to continue to grow, a great

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opportunity for pharmaceutical enterprises. The problem is that companies need to consider their distribution channel system.

Distribution channels act as a bridge between businesses and customers, helping products reach consumers quickly and at the right time, overcoming barriers of space and time (Kracht & Wang, 2010). Increasing market access by bringing products to many points of sale, promoting and expanding market coverage is also the role of distribution channels. The main purpose of choosing a pharmaceutical distribution channel is to ensure that drugs reach patients quickly, accurately and safely, while optimizing the cost and efficiency of distribution activities. The problem is that managers must find a way to prioritize the most effective distribution channel for their business.

The Analytic Hierarchy Process is a quantitative method for multi-criteria decision making, often used to evaluate and select optimal options based on hierarchical analysis (Hill et al., 2005). AHP helps organize complex problems into hierarchical structures, then compare each pair to determine the weight of the criteria and evaluate the options (Tavana et al., 2023). WPM is an MCDA method that helps evaluate and rank options based on many different criteria (AlAli et al., 2023). This study applies a combination of AHP and WPM methods to prioritize the choice of distribution channels of enterprises specializing in pharmaceutical distribution in Vietnam. The AHP method is used to find the weight of the criteria of the distribution channel, then the weighted product model is used to rank the distribution channels that need priority. The choice of distribution channel priority has a great impact on the business performance of the enterprise. The purpose of the above study is to meet that requirement. At the same time, through this study, it also affirms the superiority of the AHP method when combined with other methods, specifically in this study, the weighted product model WPM.

2. Literature Review

2.1. Distribution Channels and Criteria for Selecting Distribution Channels

In the context of modern marketing, a distribution channel is understood as an organizational system that links entities to ensure the flow of goods or services from producers to consumers in the most efficient way (Andersen & Bering, 2023). In addition to the function of transferring products, the distribution channel also plays an intermediary role in terms of information, finance, and after-sales service. In terms of structure, distribution channels are divided into two main groups: direct channels, without intermediaries, and indirect channels, with the participation of intermediaries

such as wholesalers, retailers, or agents (Sa Vinhas & Heide, 2015). The length of the channel reflects the number of intermediary levels, from one-level to three-level channels, and has a direct impact on the ability to control the market as well as distribution costs. Distribution channels serve multiple functions. They not only perform transaction functions but also handle logistics tasks and facilitate the provision of market information and customer service (Kießling et al., 2014). Each of these functions plays an essential role in optimizing distribution performance and enhancing the consumer experience. Notably, the development of digital technology is accelerating the restructuring of distribution channels. E-commerce and integrated multi-channel sales, along with the application of big data, have reshaped the way businesses approach the market (Saghiri & Mirzabeiki, 2021). No longer limited to physical space, modern distribution channels aim for flexibility, personalization, and optimization of customer experience.

In the process of selecting a distribution channel, businesses need to consider a combination of many factors to ensure effective market access and optimize resources. First of all, distribution costs are a fundamental factor that affects prices and profits (Takata, 2019). Indirect channels often save initial investment costs but reduce profit margins due to revenue sharing with intermediaries. Meanwhile, direct channels require higher operating costs but allow tighter control over branding and selling prices. The financial capacity of the business plays a decisive role in choosing the right channel model (Đalić et al., 2020). Large businesses can invest in building their own distribution systems, while small units often have to rely on distribution partners to expand the market. In addition, the accessibility of the channel, both geographically and professionally, is a key factor (Oria et al., 2017). A channel with high market coverage, a strong intermediary system, and connectivity will help products reach the right target quickly. Product characteristics determine the structure of a distribution channel (Brezović et al., 2021). Products that require strict preservation, have high value, or need professional advice will be suitable for tightly controlled channels, while popular consumer products can be distributed through more open, flexible channels. In addition, the distribution staff also plays an important role, especially in channels that require in-depth interaction. The expertise, service style, and reliability of this force directly contribute to the efficiency of channel exploitation. In addition, businesses need to consider the desired level of control and the flexible expansion capacity of each type of channel. In the context of a complex and competitive market, choosing the right distribution channel is not only about optimizing costs but also the foundation for building a sustainable advantage.

2.2. Pharmaceutical Distribution Channel

In the pharmaceutical industry, the distribution system not only plays the role of circulating goods but also contributes to ensuring the safety, effectiveness, and legality in the use of drugs (Kharytonova, 2024). Due to their specific nature, pharmaceutical distribution channels are organized into two main groups: indirect channels and direct channels, each group reflecting different approaches to the market and consumer groups. The indirect channel is a popular traditional form in which manufacturers distribute products through intermediaries such as hospitals, pharmacies, or retail systems. A typical example of this group is the ETC-Ethical drugs channel, also known as prescription drugs, where prescription drugs are distributed through medical facilities, doctors, and hospital bidding processes (Yu et al., 2010). Product consumption here depends entirely on professional decisions, requiring businesses to strictly comply with legal regulations, professional ethics, and quality control. Along with that, the OTC channel allows consumers to access non-prescription drugs through pharmacies and retail chains (Pieriegud, 2018). Although less technically constrained, this channel is still strictly managed to ensure safe use. In parallel with the indirect channel, the development of digital technology has promoted the formation of direct distribution channels. Pharmaceutical companies are increasingly proactive in approaching consumers through e-commerce websites, especially for non-prescription drugs, functional foods, and cosmeceuticals (Anis & Hassali, 2022). In addition, social networks are becoming a tool for both communication and real-time interactive consulting and sales support. Television, although traditional, is still effective among some elderly customer groups, especially when associated with direct sales (Mor et al., 2024). Unlike conventional consumer goods, pharmaceutical distribution is deeply influenced by legal factors, technical requirements, and strict storage conditions (Kumar & Kamaraj, 2022). In the context of increasing competition and changing consumer behavior, pharmaceutical companies are shifting to an integrated multi-channel model to effectively combine traditional and digital channels, thereby optimizing market coverage, operating costs, and customer experience.

2.3. Application of the AHP Method in Research on Priority Selection

The Analytic Hierarchy Process has been widely applied in many fields to support decision-making, especially in selecting optimal solutions or alternatives. Some typical studies have used AHP as a single tool. Hruška et al. (2014) implemented AHP to select the optimal supplier for a manufacturing company among three potential options.

Durão et al. (2018) proposed an AHP-based Internet of Things (IoT) technology selection model, with a four-stage process: process modeling, classification, consideration, and final selection. Tuyen (2024) applied the AHP method to have risk priority options in sea-island tourism activities. Jurík et al. (2022) applied AHP to evaluate and select optimal manufacturing projects in the direction of sustainable development. Veisi et al. (2022) applied AHP in selecting suitable irrigation systems in agriculture. In addition, Dos Santos et al. (2021) used AHP to support the decision in selecting warships, concluding that the option of building a new ship with significant improvements was the optimal choice. Nguyen and Tuyen (2024) applied AHP to the selection of tour guides. Or Rosardi et al. (2022) proposed a sustainable tourism development strategy in Indonesia based on the use of the AHP method.

In addition, many studies have combined AHP with the Weighted Product Model (WPM) to enhance the evaluation efficiency in choosing alternatives or analyzing risks. Goswami et al. (2020) applied the integrated AHP-WPM model to select the optimal laptop model, in which model 5 was identified as the best choice based on technical criteria. Lmoussaoui and Jamouli (2015) used a combination of these two methods to analyze risks in construction projects. AlAli et al. (2023) also implemented AHP combined with WPM to map and assess flood vulnerability in the Wadi Hanifah basin, Saudi Arabia.

Regarding the distribution channel area, existing studies mainly focus on analyzing efficiency, strategy and risk in specific product categories. For example, Chakrabarti & Desai (2020) evaluated the efficiency of vegetable distribution channels in Telangana; Adesoga and James (2019) studied the relationship between distribution channel strategy and marketing performance in Nigeria; Shi et al. (2020) analyzed conflicts in channel choice; Shafriani and Hartoni (2021) focused on risks in orange distribution channels in Indonesia; while Grujić et al. (2020) delve into the risks in the pharmaceutical distribution chain. Chen (2021) and Latorre Guillem (2020) analyze the role and consulting services in the insurance distribution channel, while Mariyono et al. (2020) examines the impact of distribution channels on business performance in the fruit and vegetable industry in Indonesia.

Although there have been many studies on the application of AHP in choosing optimal options and distribution channels in different industries, there is still a gap in the combined application of AHP and WPM to select distribution channels in the pharmaceutical industry, a specific industry with high requirements for quality, time and reliability in distribution. This study aims to narrow that gap by integrating the AHP method and the WPM model to build a decision-making model to support the prioritization of the most suitable pharmaceutical distribution channel for

a business in Vietnam. AHP is a multi-criteria decision making (MCDM) method that helps to deal with complex problems with many different criteria (Ishizaka & Labib, 2009). WPM is an effective MCDM technique that allows evaluating options through the weighted product of each criterion (AlAli et al., 2023). The integration of these two methods promises to bring comprehensive and highly reliable evaluation results in the context of the increasingly developing and competitive Vietnamese pharmaceutical industry.

3. Research Methods

3.1. Research Framework

To prioritize the selection of pharmaceutical distribution channels, the study applied a combination of the AHP method and the WPM weighted product model. Figure 1 describes the specific steps of the research framework.

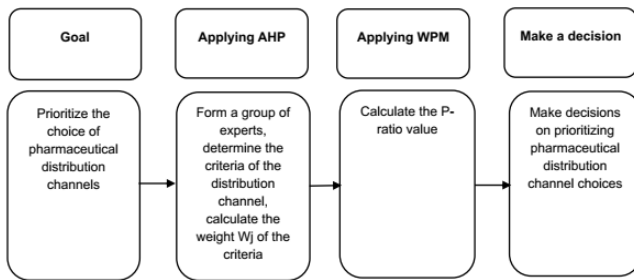


Figure 1: Research Framework

3.2. Analytical Hierarchy Process

The Analytic Hierarchy Process is a measurement theory that deals with the generation of optimal priorities from pairwise comparisons of the relative importance of homogeneous factors with respect to a common criterion or attribute (Saaty, 1994).

AHP is a widely used decision-making process in management for the purpose of establishing priorities in multi-criteria decision-making problems (Bernasconi et al., 2010).

In this method, the comparison of the relative importance of each pair of criteria is based on expert judgments through comparative scales, which measure intangible factors in relative terms (Khazaii & Khazaii, 2016).

AHP is a flexible decision-making method and can be used as a standalone tool or in combination with other tools to solve multi-criteria decision-making problems, besides, the most plausible reasons for using AHP are identified as small sample size, high consistency and wide applicability

(Darko et al., 2019).

According to Rana & Patel (2020), the steps of implementing the AHP method can be explained in the following four basic steps:

1. Identify the problem, objectives, and hierarchy of factors
2. Pairwise comparison of structural factors is performed.
3. Calculate the weights of factors.
4. Verify the results and make decisions

In this study, the AHP method is implemented to step 3, the final step of AHP is priority decision making, which will be implemented through the WPM model.

The first step is to form an expert panel and conduct a focus group discussion with pharmaceutical industry experts in Vietnam to select the criteria for a distribution channel. The hierarchical model is shown in Figure 2.

Next, the experts will continue to compare each pair of criteria based on the importance scale shown in Table 1. The issue to note before doing this is that experts must prioritize the criteria based on their feelings, then compare the importance of each pair of criteria. After having collected data from the focus group discussion of experts for comparing each pair of criteria, the author proceeds to process the data to build criteria comparison matrices.

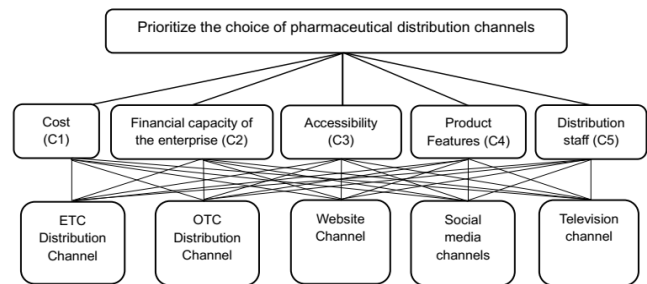


Figure 2: AHP Model Diagram for Prioritizing Pharmaceutical Distribution Channel Selection Decision Making

Next, the author will proceed to calculate the priority vector. The calculation tool used by the author is Excel software.

Table 1: Pairwise Comparison Scale with AHP Saaty (2008)

Definition of Importance	Intensity	Description
Equal importance	1	Criteria i and j are equally important
Moderate importance	3	Criteria i is less important than Criteria j
Important	5	Criteria i is more important than Criteria j
Very important	7	Criteria i is very important than Criteria j
Extremely important	9	Criteria i is definitely more important than Criteria j
Intermediate value	2;4;6;8	

The calculated value is only accepted when the consistency ratio $CR \leq 10\%$ (0.1), if the consistency coefficient is greater than 10%, the expert comparison result

must be re-checked (Saaty, 2008). With CI, CR is calculated according to the following formula: Consistency ratio CR: $CR=CI/RI$.

In which: RI: is the random consistency index (Presented in Table 2); CI: is the consistency index, $CI=(\lambda \max-n)/(n-1)$; $\lambda \max$: is the eigenvalue of the matrix, $\lambda \max=\sum_{i=1}^n wi \times \sum_{j=1}^n aij$. The list of distribution channel criteria is

presented in Table 3, the characteristics of distribution channels are shown in Table 4. The characteristics of the expert sample are shown in Table 5.

Table 2: Random Consistency Index Saaty (1984)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

Table 3: Criteria of Pharmaceutical Distribution Channels

Criteria	Description	Source
Cost	The cost here is the price for each unit of distributed product or distribution costs can be understood as the costs that businesses must pay to be able to bring products to consumers. These costs include: transportation, warehousing, packaging, inventory and costs for intermediaries related to the distribution channel.	Takata (2019)
Financial capacity of the enterprise	The amount of financial resources that the company is willing to allocate to the distribution channels and the source of funds determines the channels. Or it can be understood that the financial capacity of a distribution channel enterprise is the ability to ensure financial security and manage financial resources to operate effectively.	Đalić et al. (2020)
Distribution channel accessibility	The accessibility of distribution channels is an important factor in bringing a business's products to consumers. It can be understood as the ability to reach many customers and the ability to expand market coverage.	Oriat et al. (2017)
Product Features	Product characteristics have a significant impact on the choice of appropriate distribution channels. High-value products that require special handling or specialist advice are often suited to direct or selective distribution. Popular, low-cost consumer products are often suited to mass or mixed distribution.	Brezović et al. (2021)
Distribution staff	Competency and qualifications of sales staff in the channel. A well-trained team can enhance sales and customer service efficiency.	Discuss with expert panel

Table 4: Pharmaceutical Distribution Channels

Distribution channel	Description
ETC distribution channel	ETC distribution channel is the main distribution channel which is medical centers and hospitals.
OTC distribution channel	OTC are drugs that can be sold without a prescription, and are retail channels at pharmacies, drug stores, and drug markets.
Website Channel	Website is one of the communication channels owned by the business. This is where the business can introduce products and share valuable knowledge and information with readers.
Social media channels	The explosion of social networks with a huge number of users and daily visits has created opportunities for businesses in marketing activities and the pharmaceutical industry is no exception.
Television channel	Although users' video viewing trends have largely shifted to social media channels, the communication effectiveness that TV advertising brings to businesses cannot be denied.

The weighted results of the pharmaceutical distribution channel criteria (W_j) will be used in the next step of the research when implementing the WPM model.

3.3. WPM Method

WPM is a decision-making model that allows for the comparison of alternatives based on multiple criteria. This comparison is done by dividing the values of all criteria by one of them, and then multiplying these ratios together. Each ratio result is raised to the power corresponding to the weight of the corresponding criterion (Lmoussaoui, & Jamouli, 2015; Tofallis, 2014). According to Goswami et al. (2020), the WPM model is implemented in the following basic steps:

Step 1: Construct an evaluation matrix ($m_i \times n_j$), where m is the number of alternatives and n is the number of

criteria. For positive criteria (desirable larger values) and for negative or cost criteria (desirable smaller values).

Experts will score each alternative on each criterion. In this study, experts will score the distribution channel options on each distribution channel criterion determined from the AHP analysis results. The more appropriate the criterion is to the distribution channel, the higher the score will be. The scale used for evaluation is similar to the 100-point scale of Bangor et al. (2009), With 0/ negative, 100/ positive, negative and positive here can be interpreted as the suitability of each distribution channel criterion for each specific distribution channel.

Step 2: Build a standardized matrix by dividing the values of all criteria by one of them.

Step 3: Calculate the P ratio by comparing each alternative with another using the equation below:

$$P\left(\frac{AK}{AL}\right) = \prod_{j=1}^n \left(\frac{ak_j}{al_j}\right)^{W_j}$$

Where $i = 1, 2, 3 \dots m$; $j = 1, 2, 3 \dots n$; $k, l = 1, 2, 3 \dots m$; W_j is the weighted result of the criteria from the AHP implementation.

Consider two alternatives AK and AL, in the case of the maximization problem, If the ratio $P(AK/AL)$ is greater than or equal to the value of 1, then it indicates that the alternative AK is more desirable than the alternative AL (in the case of maximization). The best alternative is the alternative that is better or at least equal to all other alternatives.

4. Results

4.1. Expert Characteristics

Relevant experts with ten years of working experience or more (including directors, sales managers, and distribution channel managers at 7 enterprises operating in the pharmaceutical distribution sector) were selected as participants. They all have academic qualifications and knowledge, and they have a good understanding of pharmaceutical distribution activities in Vietnam. Notably, some of these experts have expertise in both the pharmaceutical industry and business. Table 5 shows the characteristics of the experts consulted for this study.

Table 5: Expert Characteristics

Job/Position	Experience in pharmaceutical distribution		
	10 years	11-15 years	16-20 years
Director	3 experts	2 experts	2 experts
Head of distribution channel	5 experts	2 experts	
Head of the sales department	1 expert	6 experts	

4.2. The Weights of Distribution Channel Criteria are Calculated According to AHP

The priority vector of distribution channel criteria when calculated by AHP is presented in Table 6.

Table 6: Priority Vector of Distribution Channel Criteria

	C1	C2	C3	C4	C5	Priority vector
C1	1	1/2	1/4	1/3	2	0.0986
C2	2	1	1/3	1/2	3	0.1611
C3	4	3	1	2	5	0.4162
C4	3	2	1/2	1	4	0.2618
C5	1/2	1/3	1/5	1/4	1	0.0624

Note: (C1) Cost; (C2) Financial capacity of the enterprise; (C3) Accessibility of distribution channel; (C4) Product characteristics; (C5) Distribution staff.

$$n = 5; \lambda_{max} = 5.0905; CI = \frac{\lambda_{max} - n}{n - 1} = \frac{5.0905 - 5}{5 - 1} = 0.0226226; CR = \frac{CI}{RI} = \frac{0.0226226}{1.12} = 0.02019$$

With the value of $CR = 0.02019 < 0.1$, there should be consistency in decision making. Therefore, we have the results of the weighting of the distribution channel criteria presented in Table 7.

Table 7: Weighting of Distribution Channel Criteria

Criteria	Weight (W_j)
Cost	0.0986
Financial capacity of the enterprise	0.1611
Distribution channel accessibility	0.4162
Product Features	0.2618
Distribution staff	0.0624

4.3. Calculation Results of P Ratio Value and Priority Selection of Distribution Channels

From the results of weight calculation by AHP analysis and the results of experts' scoring for each criterion of each distribution channel, the team built the evaluation matrix presented in Table 8 and performed standardization to obtain the standardized matrix as in Table 9.

Table 8: Evaluation Matrix

	C1	C2	C3	C4	C5
W_j	0.0986	0.1611	0.4162	0.2618	0.0624
A1	50	55	90	90	70
A2	60	65	85	85	60
A3	80	70	40	60	80
A4	95	90	85	50	90
A5	70	80	75	65	95

Note: (C1) Cost; (C2) Financial capacity of the enterprise; (C3) Accessibility of distribution channel; (C4) Product characteristics; (C5) Distribution staff; (A1) ETC distribution channel; (A2) OTC distribution channel; (A3) Website channel; (A4) Social media channel; (A5) Television channel.

Table 9: Normalization Matrix

	C1	C2	C3	C4	C5
W_j	0.0986	0.1611	0.4162	0.2618	0.0624
(A1/A2)	0.8333	0.8462	1.0588	1.0588	1.1667
(A1/A3)	0.6250	0.7857	2.2500	1.5000	0.8750
(A1/A4)	0.5263	0.6111	1.0588	1.8000	0.7778
(A1/A5)	0.7143	0.6875	1.2000	1.3846	0.7368
(A2/A3)	0.7500	0.9286	2.1250	1.4167	0.7500
(A2/A4)	0.6316	0.7222	1.0000	1.7000	0.6667
(A2/A5)	0.8571	0.8125	1.1333	1.3077	0.6316
(A3/A4)	0.8421	0.7778	0.4706	1.2000	0.8889
(A3/A5)	1.1429	0.8750	0.5333	0.9231	0.8421
(A4/A5)	1.3571	1.1250	1.1333	0.7692	0.9474

According to the weighted results W_j of the distribution channel criteria in Table 7 and the visual chart shown in Figure 3, it has been shown that three criteria are considered by managers to be of top importance, including channel accessibility, product characteristics, and financial capacity of the enterprise. These factors not only reflect the characteristics of the pharmaceutical industry but also play a decisive role in ensuring operational efficiency and suitability to the domestic market context. In particular, accessibility is considered the dominant factor, because pharmaceuticals are essential but sensitive goods that need to be distributed through a system with sufficient professional capacity and wide coverage. Choosing a channel that has close links with specialized points of sale such as hospitals, pharmacies, or clinics helps shorten the distance between manufacturers and end users while ensuring that products are used for the right purpose and indication. In addition, product characteristics are an indispensable factor, especially when the prescription and non-prescription drug segments have large differences in terms of professional advice requirements, storage conditions, and distribution mechanisms. Products that require treatment monitoring or have a high risk of misuse need to go through channels with tighter control. Meanwhile, the financial capacity of the enterprise determines the ability to invest in a suitable distribution system, thereby directly affecting the initiative and level of control of the enterprise over the channel. Enterprises with strong resources will have an advantage in building their own distribution system or implementing a modern multi-channel model.

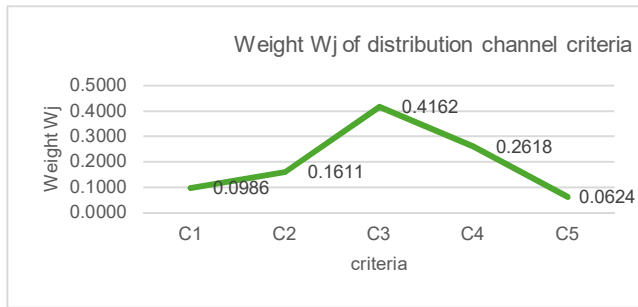


Figure 3: Weights W_j of Pharmaceutical Distribution Channel Criteria

The P ratio results in Table 10 show that the ratios $P(A1/A2) = 1.0035$, $P(A2/A4) = 1.0160$, $P(A4/A5) = 1.0295$, $P(A3/A5) = 0.7396$ all mean that the priority ranking of distribution channels is as follows:

- Rank 1: ETC distribution channel
- Rank 2: OTC distribution channel
- Rank 3: Social media channel
- Rank 4: Television channel
- Rank 5: Website channel

In terms of channel ranking, the priority order ETC > OTC > Social Network > Television > Website reflects the compatibility between the nature of pharmaceutical products and the level of professional control required. The ETC channel is at the top due to the central role of doctors and hospitals in prescribing, which is especially important for drugs that treat chronic diseases or are strictly controlled. The OTC channel, with the ability to distribute widely through the pharmacy system, takes second place because of its flexibility and fast user access speed. Social networks are third, showing the growing role of digital media in health communication, although the legality of selling drugs is still limited. Television is behind but still holds certain value for middle-aged to elderly customers. Although the website brings initiative and cost savings, its practical effectiveness is still limited due to legal barriers in drug distribution, as well as consumer psychology that does not completely trust buying drugs through digital platforms. The above findings have clear practical significance in assessing the effectiveness of distribution activities, as they provide a reference framework for businesses to balance available resources and product characteristics, thereby choosing the appropriate channel. At the same time, this result contributes to affirming that distribution effectiveness does not simply lie in the ability to cover the market but also in the level of suitability between product characteristics, consumer behavior, and channel operating capacity. In the context of the Vietnamese pharmaceutical industry shifting towards modernization and multi-channel, these priority criteria and selection order will be an important foundation to help businesses shape a more sustainable and flexible distribution strategy in the future.

Table 10: P-ratio Values and Priority Ranking of Distribution Channel Selection

P ratio	Value	Rank
$P(A1/A2)$	1.0035	A1>A2>A4>A5>A3
$P(A1/A3)$	1.4193	
$P(A1/A4)$	1.0196	
$P(A1/A5)$	1.0497	
$P(A2/A3)$	1.4144	
$P(A2/A4)$	1.0160	
$P(A2/A5)$	1.0461	
$P(A3/A4)$	0.7184	
$P(A3/A5)$	0.7396	
$P(A4/A5)$	1.0295	

5. Conclusion, Implications, and Limitations

5.1. Conclusion

This study uses a combination of the AHP method and the

WPM model to prioritize the choice of distribution channels for pharmaceutical distribution businesses in Vietnam. Through group discussions with experts, the study identified the criteria for pharmaceutical distribution channels, then the AHP method was used to calculate the weights of the criteria, and then the WPM model was used to rank the priority of distribution channel choices. The calculation results show that the ratios $P(A1/A2)= 1.0035$, $P(A2/A4)= 1.0160$, $P(A4/A5)= 1.0295$, $P(A3/A5)= 0.7396$ all of which mean that the ETC distribution channel is the top priority choice, followed by the OTC distribution channels, social media channels, television channels and finally the website channel.

5.2. Implication

From the research results, the authors propose some management implications as follows:

When choosing criteria for a distribution channel: Managers, especially in new businesses operating in the pharmaceutical industry, need to pay attention to criteria such as the accessibility of the distribution channel, the characteristics of the products in the distribution channel and the financial capacity of the business.

The accessibility of the distribution channel is a key factor determining the success of distribution work, it answers the question of whether the product reaches the target customers or not and whether consumers can easily buy them or not, directly affecting whether the business can achieve its business goals or not. Meanwhile, understanding the characteristics of the product helps businesses choose the right distribution channel, limit costs, increase sales and build sustainable relationships with customers. As for financial capacity, it plays an important role in building and maintaining distribution channels, affecting the ability to expand the market of the enterprise, affecting the competitiveness and sustainable growth of the enterprise.

When choosing a distribution channel: Depending on the characteristics of the enterprise, there are long-standing or new enterprises operating in the pharmaceutical industry, however, the two distribution channels ETC and OTC are still the two main distribution channels that business administrators should aim for.

In recent years in Vietnam, hospital systems from upper to lower levels have been invested in expanding in scale, depth and breadth, especially more and more private hospitals are being established, so the ETC channel should always be one of the main distribution channels of the enterprise. With the OTC channel, this is a fairly popular distribution channel in Vietnam, with a large market coverage because this is an urgent need of the people, the number of private pharmacies and drugstores is gradually increasing and accounting for a large part of the pharmaceutical distribution market. What needs to be noted

when businesses approach these two distribution channels is to consider the distribution staff, need to train and improve their professional quality as well as increase incentives to retain experienced distribution staff. In addition, today with the explosion of information and communication technology, the number of social network users in Vietnam is increasing sharply every year, this is a highly interactive channel, social networks help businesses get closer to customers. Therefore, social networks are also a distribution channel that pharmaceutical businesses need to pay attention to, businesses can take advantage of social networks to implement marketing programs, promote products, increase access to customers while reducing costs for distribution activities.

5.3. Limitations

This study only focuses on the pharmaceutical distribution channel, future studies can expand the scope to different subjects. The sample of experts in this study is 21 experts from 7 pharmaceutical distribution businesses in Vietnam, future studies can increase the sample size to a larger number.

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Declarations

Ethics Approval and Consent to Participate

This research involved the use of existing non-identifiable data and expert opinions from pharmaceutical distribution companies. It was determined to be exempt from review by the Institutional Review Board of Industrial University of Ho Chi Minh City in accordance with the university's regulations on research ethics for social science studies.

Competing Interests / Conflicts of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Author Contributions

[Khoat Tran VAN] conceived and designed the study, conducted the data analysis, data collection and wrote the original draft. [Anh Tuan NGUYEN] contributed to data collection and manuscript revision. [Vo Van TUYEN] contributed to data collection, and critically revised the manuscript. All authors read and approved the final manuscript.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the authors used ChatGPT-4 (OpenAI) to improve the clarity and readability of the manuscript and to generate initial ideas for the literature review structure. All AI-generated content was thoroughly reviewed, revised, and verified by the authors. The authors take full responsibility for the final content of the publication.

References

- Adesoga, A. D., & James, A. A. (2019). Channel strategy and marketing performance of selected consumer goods firms in Lagos State, Nigeria. *Academy of Marketing Studies Journal*, 23(1), 1–18.
- AlAli, A. M., Salih, A., & Hassaballa, A. (2023). Geospatial-based analytic hierarchy process (AHP) and weighted product model (WPM) techniques for mapping and assessing flood susceptibility in the Wadi Hanifah drainage basin, Riyadh Region, Saudi Arabia. *Water*, 15(10), Article 1943. <https://doi.org/10.3390/w15101943>
- Andersen, T. J., & Bering, S. (2023). Integrating distribution, sales and services in manufacturing: A comparative case study. *International Journal of Operations & Production Management*, 43(10), 1489–1519. <https://doi.org/10.1108/IJOPM-03-2022-0198>
- Anis, M. S., & Hassali, M. A. (2022). Pharmaceutical marketing of over-the-counter drugs in the current digital era: A review. *Pharmaceutical Sciences Asia*, 49(2). <https://doi.org/10.29090/psa.2022.02.21.102>
- Bangor, A., Kortum, P., & Miller, J. (2009). Determining what individual SUS scores mean: Adding an adjective rating scale. *Journal of Usability Studies*, 4(3), 114–123.
- Bernasconi, M., Choirat, C., & Seri, R. (2010). The analytic hierarchy process and the theory of measurement. *Management Science*, 56(4), 699–711. <https://doi.org/10.1287/mnsc.1090.1123>
- Brezović, K., Stanković, R., Šafran, M., & Kolarić, G. (2021). Applying multi-criteria analysis in evaluation of distribution channels. In *Transformation of transportation* (pp. 105–122). Springer. https://doi.org/10.1007/978-3-030-82250-0_7
- Chakrabarti, D., & Desai, K. (2020). Analysis of efficiency of different distribution channels for select vegetables: An analytical study of Telangana region. *International Journal of Supply Chain Management*, 9(5), 14–23.
- Chen, T. J. (2021). The role of distribution channels in market discipline for the life insurance industry. *The Geneva Papers on Risk and Insurance: Issues and Practice*, 46(1), 107–129. <https://doi.org/10.1057/s41288-020-00172-9>
- Darko, A., Chan, A. P. C., Ameyaw, E. E., Owusu, E. K., Pärn, E., & Edwards, D. J. (2019). Review of application of analytic hierarchy process (AHP) in construction. *International Journal of Construction Management*, 19(5), 436–452. <https://doi.org/10.1080/15623599.2018.1452098>
- Dos Santos, M., de Araújo Costa, I. P., & Gomes, C. F. S. (2021). Multicriteria decision-making in the selection of warships: A new approach to the AHP method. *International Journal of the Analytic Hierarchy Process*, 13(1). <https://doi.org/10.13033/ijahp.v13i1.833>
- Durão, L. F. C., Carvalho, M. M., Takey, S., Cauchick-Miguel, P. A., & Zancul, E. (2018). Internet of Things process selection: AHP selection method. *The International Journal of Advanced Manufacturing Technology*, 99, 2623–2634. <https://doi.org/10.1007/s00170-018-2617-2>
- Đalić, I., Stević, Ž., Erceg, Ž., Macura, P., & Terzić, S. (2020). Selection of a distribution channel using the integrated FUCOM–MARCOS model. *International Review*, 4(3), 80–96.
- Goswami, S. S., Behera, D. K., & Mitra, S. (2020). A comprehensive study of weighted product model for selecting the best laptop model available in the market. *Brazilian Journal of Operations & Production Management*, 17(2), 1–18. <https://doi.org/10.14488/BJOPM.2020.017>
- Grujić, J., Morača, S., & Fajsi, A. (2020). Analysis of risk factors in the channels of drug distribution: Professional perspectives. *Sustainability*, 12(11), Article 4787. <https://doi.org/10.3390/su12114787>
- Hill, M. J., Braaten, R., Veitch, S. M., Lees, B. G., & Sharma, S. (2005). Multi-criteria decision analysis in spatial decision support: The ASSESS analytic hierarchy process and the role of quantitative methods and spatially explicit analysis. *Environmental Modelling & Software*, 20(7), 955–976. <https://doi.org/10.1016/j.envsoft.2004.04.014>
- Hruška, R., Průša, P., & Babić, D. (2014). The use of the AHP method for supplier selection. *Transport*, 29(2), 195–203. <https://doi.org/10.3846/16484142.2014.930928>
- Ishizaka, A., & Labib, A. (2009). Analytic hierarchy process and expert choice: Benefits and limitations. *OR Insight*, 22(4), 201–220. <https://doi.org/10.1057/ori.2009.10>
- Jurík, L., Horňáková, N., Šantavá, E., Cagaňová, D., & Sablik, J. (2022). Application of the AHP method for project selection in the context of sustainable development. *Wireless Networks*, 28, 1–10. <https://doi.org/10.1007/s11276-020-02322-2>
- Kharytonova, G. (2024). Pharmaceuticals: Management safety of circulation of drugs. *SSP Modern Pharmacy and Medicine*, 4(2), 1–10. <https://doi.org/10.53933/ssppm.v4i2.148>
- Khazaii, J., & Khazaii, J. (2016). Analytic hierarchy process (AHP). In *Advanced decision making for HVAC engineers* (pp. 73–85). Springer. https://doi.org/10.1007/978-3-319-33328-1_9
- Kiessling, T., Harvey, M., & Akdeniz, L. (2014). The evolving role of supply chain managers in global channels of distribution and

- logistics systems. *International Journal of Physical Distribution & Logistics Management*, 44(8–9), 671–688. <https://doi.org/10.1108/IJPDLM-06-2013-0166>
- Kracht, J., & Wang, Y. (2010). Examining the tourism distribution channel: Evolution and transformation. *International Journal of Contemporary Hospitality Management*, 22(5), 736–757. <https://doi.org/10.1108/09596111011053837>
- Kumar, P., & Kamaraj, R. (2022). Compliance with regulatory requirements regarding storage and distribution of pharmaceuticals in India, the United States, and the European Union. *NeuroQuantology*, 20(17), 390–398. <https://doi.org/10.14704/NQ.2022.20.17.NQ88053>
- Latorre Guillen, M. A. (2020). Customer-oriented service of Spanish brokers in the insurance industry: The advisory service of the bancassurance distribution channel. *Sustainability*, 12(7), Article 2970. <https://doi.org/10.3390/su12072970>
- Mariyono, J., Waskito, J., & Kuntariningsih, A. (2020). Distribution channels of the vegetable industry in Indonesia: Impact on business performance. *International Journal of Productivity and Performance Management*, 69(5), 963–987. <https://doi.org/10.1108/IJPPM-11-2018-0382>
- Mor, J., Kaur, T., Menkes, D. B., Peter, E., & Grundy, Q. (2024). Pharmaceutical industry promotional activities on social media: A scoping review. *Journal of Pharmaceutical Health Services Research*, 15(4), Article rmae022. <https://doi.org/10.1093/jphsr/rmae022>
- Nguyen, A. T., & Tuyen, V. V. (2024). Application of the analytic hierarchy process and weighted sum model for tour guide selection: A case study of a travel company in Vietnam. *Tourism Spectrum: Diversity and Dynamics*, 1(2), 93–103. <https://doi.org/10.56578/tsdd010203>
- Nguyen, L. T., Nantharath, P., & Kang, E. (2022). A sustainable care model for an ageing population in Vietnam: Evidence from a systematic review. *Sustainability*, 14(5), Article 2518. <https://doi.org/10.3390/su14052518>
- Nguyen, T. M. A., Pham, M. C., & Vu, D. N. H. (2024). The resilience of supply chains: The case of Vietnamese pharmaceutical companies. *Journal of Science and Technology: Engineering and Technology for Sustainable Development*, 34(4), 57–65. <https://doi.org/10.51316/jst.177.etsd.2024.34.4.8>
- Oriat, A., Khabiri, N., & Kazemi, A. (2017). Ranking factors affecting customer preference in distribution channel selection using fuzzy AHP and TOPSIS. In *Proceedings of the International Conference on New Researches in Management, Economics, Accounting and Humanities* (pp. 1–20).
- Pieriegud, J. (2018). The development of digital distribution channels in Poland's retail pharmaceutical market. In *Exploring omnichannel retailing* (pp. 139–167). Springer. https://doi.org/10.1007/978-3-319-98273-1_7
- Rana, S. C., & Patel, J. N. (2020). Selection of the best location for small hydropower projects using AHP, WPM, and TOPSIS methods. *ISH Journal of Hydraulic Engineering*, 26(2), 173–178. <https://doi.org/10.1080/09715010.2018.1468827>
- Rosardi, R. G., Prajanti, W., Dian, S., Atmaja, H. T., & Yanti, D. (2022). Sustainable tourism development strategy using the analytic hierarchy process: The case of Pagilaran Tea Plantation agrotourism, Indonesia. *International Journal of Sustainable Development & Planning*, 17(4).
- Saaty, T. L. (2008). Decision making with the analytic hierarchy process. *International Journal of Services Sciences*, 1(1), 83–98. <https://doi.org/10.1504/IJSSCI.2008.017590>
- Saaty, T. L. (1994). Highlights and critical points in the theory and application of the analytic hierarchy process. *European Journal of Operational Research*, 74(3), 426–447. [https://doi.org/10.1016/0377-2217\(94\)90222-4](https://doi.org/10.1016/0377-2217(94)90222-4)
- Saaty, T. L. (1984). The analytic hierarchy process: Decision making in complex environments. In *Quantitative assessment in arms control* (pp. 285–308). Springer. https://doi.org/10.1007/978-1-4613-2805-6_12
- Saghiri, S., & Mirzabeiki, V. (2021). Omni-channel integration: The matter of information and digital technology. *International Journal of Operations & Production Management*, 41(11), 1660–1710. <https://doi.org/10.1108/IJOPM-04-2021-0262>
- Sa Vinhas, A., & Heide, J. B. (2015). Forms of competition and outcomes in dual distribution channels: The distributor's perspective. *Marketing Science*, 34(1), 160–175. <https://doi.org/10.1287/mksc.2014.0880>
- Shafriani, K. A., & Hartoni, H. (2021). Risk analysis of the Siam Banjar orange supply chain distribution channel in Barito Kuala Regency. *Tropical Wetland Journal*, 7(1), 10–16. <https://doi.org/10.20527/twj.v7i1.103>
- Shi, T., Chhajed, D., Wan, Z., & Liu, Y. (2020). Distribution channel choice and divisional conflict in remanufacturing operations. *Production and Operations Management*, 29(7), 1702–1719. <https://doi.org/10.1111/poms.13185>
- Takata, H. (2019). Transaction costs and capability factors in dual or indirect distribution channel selection: An empirical analysis of Japanese manufacturers. *Industrial Marketing Management*, 83, 94–103. <https://doi.org/10.1016/j.indmarman.2018.11.003>
- Tavana, M., Soltanifar, M., & Santos-Arteaga, F. J. (2023). Analytic hierarchy process: Revolution and evolution. *Annals of Operations Research*, 326(2), 879–907. <https://doi.org/10.1007/s10479-021-04432-2>
- Tofallis, C. (2014). Add or multiply? A tutorial on ranking and choosing with multiple criteria. *INFORMS Transactions on Education*, 14(3), 109–119. <https://doi.org/10.1287/ited.2013.0124>
- Tuyen, V. V. (2024). Prioritization of risk factors in sea-island tourism: Evidence from Quang Ngai Province, Vietnam. *Tourism Spectrum: Diversity and Dynamics*, 1(3), 141–151. <https://doi.org/10.56578/tsdd010302>
- Veisi, H., Deihimfard, R., Shahmohammadi, A., & Hydarzadeh, Y. (2022). Application of the analytic hierarchy process in multi-criteria selection of agricultural irrigation systems. *Agricultural Water Management*, 267, Article 107619. <https://doi.org/10.1016/j.agwat.2022.107619>
- Yu, X., Li, C., Shi, Y., & Yu, M. (2010). Pharmaceutical supply chain in China: Current issues and implications for health system reform. *Health Policy*, 97(1), 8–15. <https://doi.org/10.1016/j.healthpol.2010.02.010>