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Analysis of the driving mechanism of digital platform economy on the innovation of traditional retail business models

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SUMMARY: *This article aims to explore the innovation of retail enterprise business models to cope with the challenge of weak industry growth. By constructing a grey wolf optimization AHP store grading evaluation model, the goal of improving single store yield can be achieved. Combining knowledge from multiple disciplines such as marketing and management, this article selects seven reference indicators, including the economic status, population consumption level, and consumption concept of the location of the store, to construct a grey wolf optimization AHP store grading evaluation model. Through empirical analysis of 15 listed retail companies, the Analytic Hierarchy Process (AHP) was used for weight allocation and consistency testing, and the grey wolf optimization algorithm was combined to improve the AHP evaluation process. The empirical analysis results show that there are differences in the AHP evaluation values of different retail enterprises. Some enterprises such as Minsheng Jiale and Hualian Comprehensive Supermarket have higher evaluation values, while Yonghui Supermarket, Xinbai Supermarket and other enterprises have lower evaluation values. The analysis also indicates that business model innovation is influenced by multiple factors at both macro and micro levels. Retail enterprise business model innovation needs to comprehensively consider multiple factors, optimize the store grading evaluation model, implement differentiated competition strategies, and enhance single store sales capabilities. At the same time, enterprises should pay attention to consumer needs and innovate in market segmentation, market positioning, marketing mix, and other aspects to meet the needs of different consumers and achieve sustainable development.*

KEYWORDS: *digital platform economy; retail; Business model innovation; Driving mechanism; Grey Wolf Optimization Algorithm; analytic hierarchy process*

1 Introduction

According to the data displayed in the article "2024 Major Retail Enterprise Store Closure Statistics" on January 22, 2023, the first portal website of the domestic retail industry, Lianshang Net, as of December 31, 2024, a total of 201 major retail enterprises, mainly supermarkets and department stores, have closed stores nationwide, setting a record high. This number has increased by 474.29% compared to 35 stores in 2023 [1, 2]. Although the per capita disposable income of Chinese residents has shown a stable growth trend since the first half of 2024 due to the impact of macroeconomic soft landing, and the market has begun to gradually

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digest the impact of the "three public policies", the retail industry still cannot escape the current weak growth situation in the short term. On the other hand, in the environment of digital platform economy, due to the popularity of Internet terminals, the rapid growth of e-commerce, such as the rapid development of e-commerce retail platforms such as Taobao, JD, etc., and the continuous occupation of retail commodity sales share with the traditional retail industry, the retail industry's physical store business has been greatly impacted [3]. In recent years, with the rise in prices, the cost of the retail industry has also been continuously increasing. Since 2011, the retail industry has been facing difficulties such as high competition and low returns. In addition, the impact of new digital platform economy sales channels on traditional retail store terminals has slowed down the overall growth of the retail industry, and many retail enterprises have shown negative growth.

According to the article "Analysis of the Development Status of Domestic Retail Industry in 2024" by Forward looking Network, the total retail sales of 50 key large-scale retail enterprises in China in 2024 decreased by 0.7% year-on-year [4]. After a slight year-on-year increase in November, the retail sales of 50 key large retail enterprises in China in December 2024 once again showed a year-on-year decline of 0.2% in monthly retail sales, marking the seventh negative growth in monthly retail sales within 2024. In December, 35 out of 50 retail enterprises had a year-on-year negative growth in retail sales, higher than the same period in 2013 and November 2024. In terms of product categories, in December 2024, the year-on-year growth rates of retail sales of daily necessities, food, clothing, gold, silver, jewelry, cosmetics, and home appliances of 50 key large retail enterprises in China were -15.87%, -6.73%, -0.39%, 1.68%, 3.07%, and 4.54%, respectively [5]. Compared with the same period in 2013, the changes in growth rates were -0.46, -17.47, -35.12, -2.83, -16.15, and -11.17 percentage points, respectively. On a monthly basis, the sales of household appliances in the retail category have shown good performance, with the first year-on-year positive growth since July 2024; Although gold, silver, jewelry, and cosmetics maintained a growth trend, they still slowed down compared to the same period in 2013; Clothing, food, and daily necessities categories showed negative year-on-year growth, with clothing retail sales experiencing the third negative growth this year. Food and daily necessities categories experienced a significant decline due to adjustments in store closures and a higher base compared to the same period last year. How to attract more consumers and maintain sales growth is a survival issue that is testing traditional retail enterprises.

At present, various retail enterprises are breaking through their existing development models in response to changes in the external environment. In terms of business strategy transformation, expanding business channels and implementing differentiated competition have become the preferred competitive methods for most enterprises. To some extent, unified management of all storefronts in enterprises can no longer meet the needs of enterprise development [6]. Traditional management models cannot meet the requirements for the most reasonable allocation of enterprise resources. Therefore, more and more enterprises are paying attention to business model innovation and exploring increasingly refined store management models. Innovation in the business model of retail enterprises is not only about the rational allocation of goods and human resources, but also about building a "pyramid" style store structure, which has strategic significance for the long-term development of enterprises. (1) Effectively implementing single store management strategies in store terminal management can continuously promote the sales ability of stores at all levels. (2) Effectively evaluating and diagnosing the management and operation level of various regions, branches, and stores. (3) Timely discovering excellent A-level stores, summarizing their successful experiences and excellent operation models, and promoting them in a timely manner. (4) Discovering outdated stores, targeted exploration of their potential, changing their inappropriate business and

management methods, and promoting the improvement of performance in this category of stores.

However, in the current academic research in China, there is still a lack of a complete system for studying the business model innovation of retail enterprises. Research on how to innovate the business model of stores and how to manage them at different levels after business model innovation is still relatively scattered. Therefore, based on the exploration of the basic theory of business model innovation and the reference of domestic and foreign research results, this article combines knowledge from multiple disciplines such as marketing, management, and technical and economic evaluation methods to construct the Grey Wolf Optimization AHP Store Grading Evaluation Model and the Store Pareto Grading Business Model Innovation System. This model is applied to the management innovation project of the author's internship company, with the aim of achieving the company's goal of improving single store yield and making a modest contribution to helping Chinese retail enterprises out of the trough.

2 Related works

From the existing literature, there are few foreign scholars who have conducted systematic theoretical research on business model innovation [7], but practical applications of business model innovation are quite common. Some first-line international brands also carry out graded business model innovation in their stores around the world. For example, the Louis Vuitton brand is sold according to three levels in Japan, Hong Kong and Chinese Mainland. From the perspective of consumption level, the three regions have obvious differences, so the brand's positioning is different, and the styles of clothing and accessories are also different. For another example, Wal Mart Supermarket, the world's retail giant, also implements the innovation of the hierarchical business model. In economically developed cities, there are Sam's Club stores that only develop for members. In economically prosperous areas of first tier cities, there are large supermarkets, and community stores that specifically target communities. Supermarkets are opened in urban economic centers of second tier and third tier cities. The size of supermarkets and the level of goods sold are clearly graded.

The research on the methods and theories used in this article has been widely discussed and applied in foreign countries. For the application of ABC grading method, there has been a long history of research and practical operation abroad. Since Pareto first proposed this analysis method in 1879, the scope of application of Pareto grading method has been from economics to quality management to general application in the field of management for more than a hundred years. Scholars have introduced this analysis method from their respective research fields to serve the research content [8]. As mentioned in reference [9], when conducting project risk research and risk management, according to the principle of Pareto analysis, it is proposed to focus on controlling and resolving the 20% risks that have the greatest impact on the project, which will bring the best "risk investment return rate" to the entire project. Reference [10] established the EIQ-ABC model and applied it to the distribution management of cigarette companies, effectively saving the company's operating costs. The article used ABC analysis to determine the importance of cigarette distribution centers and then identified a specific number of equipment to meet the functional requirements of cigarette distribution centers. Finally, it was pointed out that this method can be well applied in various logistics industries.

The research on using AHP and DEA methods for performance evaluation is no longer in the exploratory stage. Reference [11] used the particle swarm optimization AHP method to analyze the business performance of 39 telecommunications operators on the 2000 Forbes list. Reference [12] used DEA method to analyze the relationship between personnel shareholding

and efficiency within retail enterprises, and concluded that there is a positive relationship between the two. Reference [13] analyzed the intrinsic relationship between retail store efficiency, economies of scale, and product differentiation based on data from Japanese department stores and supermarkets from 1995 to 2004. The study showed that economies of scale and product differentiation contribute to further improving retail efficiency. Reference [14] used particle swarm optimization AHP method to select 300 online retailers to investigate the significance of search engine advertising for online retailers. The conclusion drawn is that maximizing advertising output under limited resources determines the effectiveness of search engine advertising strategy.

It can be seen that the above methods have been recognized and practiced by many experts internationally, and the research conclusions of the experts have laid a solid theoretical foundation and empirical guidance for the research in this article. Although there is a lack of research on the above methods for retail business model innovation, scholars have confirmed that these methods can provide a good basis for retail business model innovation.

3 Selection of Innovation Indicators for Store Business Models

The main purpose of selecting grading indicators for retail stores is to scientifically and systematically evaluate and classify different stores in a reasonable manner, in order to optimize resource allocation, improve operational efficiency, and enhance market competitiveness. In the existing reference materials, Table 1 summarizes the opinions of scholars on the performance evaluation of retail business model innovation, which can provide some reference for the selection of business model innovation indicators in this article.

Table 1: Examples of Reference Indicators in Existing Literature

Existing research	Evaluation indicators
Reference [14]	1) Financial aspects: sales completion rate, gross profit completion rate, sales growth rate; 2) In terms of internal processes: team cohesion, timely implementation of superior work, turnover days of product inventory, and store image; 3) Customer aspect: customer satisfaction, new customer acquisition rate, number of customer complaints; 4) In terms of learning and growth: completion rate of training plans, employee turnover control rate
Reference [15]	Lease area, revenue, commission ratio, floor area efficiency, growth rate, and gross profit margin of sales.
Reference [16]	1) Financial indicators: sales volume, sales profit margin, sales expense ratio, and planned completion rate; 2) Customer indicators: market share, customer acquisition rate; 3) Internal management indicators: customer satisfaction, payment collection rate, decision-making basis, reasonableness of plans, brand awareness.
Reference [17]	1) Income level: Basic earnings per share, net profit, return on equity, and growth rate of after tax profit; 2) At the operational level: operating costs, revenue, profit, inventory turnover rate; 3) Management level: management expenses, financial expenses, sales expenses, number of employees in the enterprise.
Reference [18]	Scale strength, industry structure, business innovation, industry demand, industry development potential, industry growth potential, industry profitability, urban resources

This article evaluates the innovation of retail store business models based on 7 reference indicators, including subjective and objective conditions, by referencing literature, searching online materials, actual work experience in the unit, and consulting with professional and management personnel. The specific indicators are shown in Figure 1.

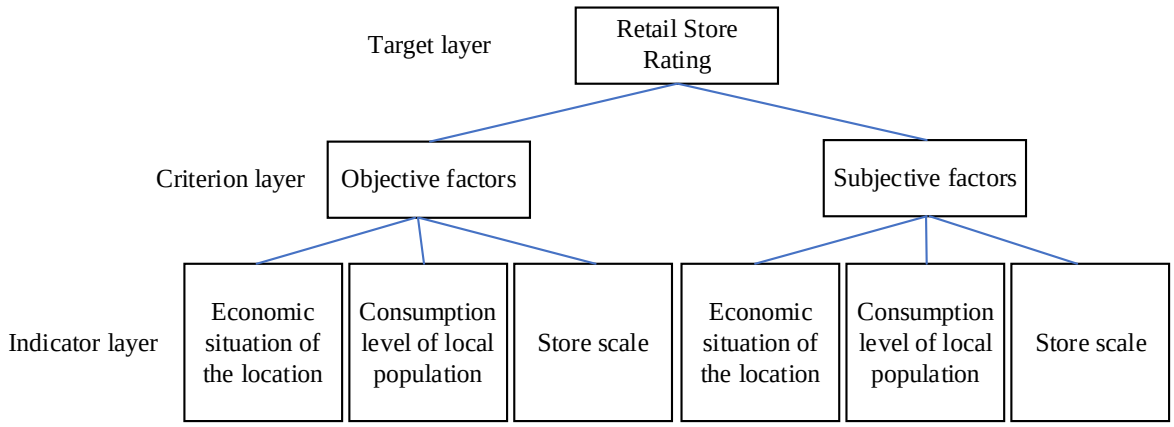

Figure 1: Retail Business Model Innovation Store Rating Index System

(1) The economic situation of the location where the store is located. We usually evaluate the economic situation of a region based on GDP data. GDP (Gross Domestic Product) refers to the value of all products and services produced by a country or region's economy during a certain period of time (a quarter or a year). It is widely recognized as the best indicator to measure a country's economic situation. It can not only reflect a country's national strength and wealth, but also its economic performance. Therefore, this indicator can be used to measure the economic development level of a province or city, and the GDP value of a region is relatively easy to obtain, meeting the corresponding principles for selecting indicators in this article. When selecting this indicator for store rating, we use the national average GDP as the benchmark, compare the GDP of the sample location with the benchmark, use the quotient of the sample value and the benchmark value as the indicator score, and then subtract the product of the score and the weight of the indicator to calculate the total score.

(2) The consumption level and consumption concept of the population in the location of the store. Considering the availability and representativeness of data, this article evaluates based on the consumption level of residents in the province where the store is located, the average salary of on duty employees in the city, and the total retail sales of social goods. The scoring method is the same as the indicator.

(3) Store size. This indicator is evaluated based on the store area, with the average value of the selected indicator as the benchmark, and scored using the same method as the indicator.

(4) Employee quality. This indicator considers the sales ability of store employees, that is, the ability to bargain with customers, and its evaluation criteria are store product sales discounts. For retail stores with the "store in store" model, this indicator also needs to consider the collection rate after deducting mall deductions. The benchmark for this indicator is also the sample average, and the scoring criteria are the same as the indicator.

(5) Store gross profit margin. The gross profit margin of a retail store is equal to the ratio of gross profit to operating revenue, measuring the store's profitability over a certain period of time. The size of gross profit depends on two factors, one is the quantity factor, which is the amount of sales, and the other is the quality factor, which is the size of unit gross profit. For the evaluation of enterprises or accounts receivable organizations, this indicator is one of the indispensable indicators, and the values of this part of the indicator are relatively easy to obtain and have strong comparability. The scoring of this indicator is based on the average value of

the selected sample, and the scoring is the same as above.

(6) Store net profit margin. The net profit margin evaluation is equal to the ratio of the net profit after deducting various expenses from the gross profit of the store to the main business income. It not only reflects the store's ability to receive payments, but also reflects the store's expense ratio. Compared with the gross profit margin of the store, the closer the two are, the lower the period expenses of the enterprise. Therefore, it can also be used to evaluate the resource utilization rate. The scoring principle is the same as above.

(7) The input-output efficiency (resource utilization rate) of the storefront may appear to overlap with indicator 6 on the surface, but in reality, this part evaluates the resource utilization rate of the storefront from a more objective and in-depth perspective. The content reflected by this indicator parameter is different from the above six indicators, reflecting the degree of resource utilization of the storefront, which can effectively correct the evaluation results. For example, when evaluating the operational efficiency of a company's subsidiaries, an accounting ratio such as the cost of each sales transaction can be used. Compared to other branches, a branch with a higher ratio can be considered to have lower operational efficiency, but further consideration suggests that a higher ratio may be due to a relatively more complex trading portfolio. Even widely based indicators such as profitability, investment return, and comprehensive performance evaluation are highly correlated, but they are not sufficient to assess the operational efficiency of a service unit. For example, you cannot conclude that a profitable branch is necessarily effective in the use of employees and other inputs. The higher-than-average ratio of profitable business can better explain its profitability than the cost efficiency of resource utilization. The scoring principle for this indicator is different from the above six indicators, and the product of the indicator weight and the comprehensive efficiency calculated by DEA is included in the total score.

4 AHP evaluation algorithm based on grey wolf optimization

4.1 Grey Wolf Optimization Algorithm

The grey wolf optimization algorithm is an intelligent optimization algorithm with the characteristics of simple structure, few adjustable parameters, easy implementation, and good solution accuracy and convergence speed [19]. Similar to other intelligent optimization algorithms, the grey wolf optimization algorithm corresponds to a possible solution for each wolf's position, and the development of the wolf pack is achieved through proxy transmission. The grey wolf optimization algorithm first selects the optimal three wolves based on their fitness and determines their positions during implementation; Then, determine the distance between the three leading wolves and other wolves, and the wolf pack slowly approaches the prey under the guidance of the three leading wolves to achieve the final result. The specific steps of the grey wolf optimization algorithm are as follows:

Step 1: Social stratification. Wolf packs have a very strict hierarchical system, with the best wolf being α, who has absolute leadership; The second-best wolf is β, which ranks second only to α in the wolf pack and is responsible for assisting α in decision-making; The wolf second only to α and beta is δ; The rest of the wolves are ω, the lowest level wolves, mainly responsible for balancing internal relationships within the race. The social hierarchy of the Grey Wolf Optimization algorithm is pyramid shaped, as shown in Figure 1.

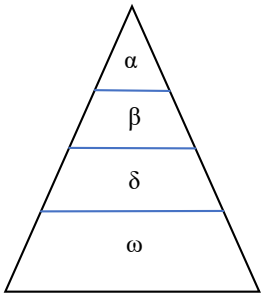

Figure 1: Social stratification of grey wolf optimization algorithm

Step 2: Surround the prey. After finding the prey, the wolf pack will surround it, and its mathematical model is as follows:

$$\boldsymbol{D}(t) = \left|\boldsymbol{C} \circ \boldsymbol{X}_{\mathrm{p}}(t) - \boldsymbol{X}(t)\right| \tag{1}$$

$$\boldsymbol{X}(t+1) = \boldsymbol{X}_{\mathrm{p}}(t) - \boldsymbol{A} \circ \boldsymbol{D}(t) \tag{2}$$

where, $\boldsymbol{X}_{\mathrm{p}}$ is the location of prey; $\circ$ represents Hadamard product operation; $\boldsymbol{X}$ is the location of the grey wolf; $\boldsymbol{D}$ is the distance between the grey wolf and its prey; t is the number of iterations; $\boldsymbol{A}$ and $\boldsymbol{C}$ are control parameters and swing factors, respectively. $\boldsymbol{A}$ and $\boldsymbol{C}$ are as follows:

$$2\boldsymbol{a} \circ \boldsymbol{r}_1 - \boldsymbol{a} \tag{3}$$

$$\boldsymbol{C} = 2\boldsymbol{r}_2 \tag{4}$$

where, $\boldsymbol{r}_1$ and $\boldsymbol{r}_2$ are random vectors with modulus [0,1]; $\boldsymbol{a}$ is the convergence factor, and its modulus decreases linearly from 2 to 0 with the number of iterations.

Step 3: Hunting for prey. After identifying the prey, ω will hunt it according to the instructions of α, β, and δ, continuously updating its position within the search range. The position update formula is as follows:

$$\begin{cases} \boldsymbol{D}_{\alpha}(t) = \left|\boldsymbol{C}_1 \circ \boldsymbol{X}_{\alpha}(t) - \boldsymbol{X}_{\omega}(t)\right| \\ \boldsymbol{D}_{\beta}(t) = \left|\boldsymbol{C}_2 \circ \boldsymbol{X}_{\beta}(t) - \boldsymbol{X}_{\omega}(t)\right| \\ \boldsymbol{D}_{\delta}(t) = \left|\boldsymbol{C}_3 \circ \boldsymbol{X}_{\delta}(t) - \boldsymbol{X}_{\omega}(t)\right| \end{cases} \tag{5}$$

$$\begin{cases} \boldsymbol{X}_1(t) = \boldsymbol{X}_{\alpha}(t) - \boldsymbol{A}_1 \circ \boldsymbol{D}_{\alpha}(t) \\ \boldsymbol{X}_2(t) = \boldsymbol{X}_{\beta}(t) - \boldsymbol{A}_2 \circ \boldsymbol{D}_{\beta}(t) \\ \boldsymbol{X}_3(t) = \boldsymbol{X}_{\delta}(t) - \boldsymbol{A}_3 \circ \boldsymbol{D}_{\delta}(t) \end{cases} \tag{6}$$

where, $\boldsymbol{X}_{\alpha}(t)$, $\boldsymbol{X}_{\beta}(t)$, $\boldsymbol{X}_{\delta}(t)$, and $\boldsymbol{X}_{\omega}(t)$ are the positions of α, β, δ, and ω, respectively; $\boldsymbol{D}_{\alpha}(t)$, $\boldsymbol{D}_{\beta}(t)$, $\boldsymbol{D}_{\delta}(t)$ are the distances between α, β, δ and ω, respectively; The calculation formulas for $\boldsymbol{A}_1$, $\boldsymbol{A}_2$, $\boldsymbol{A}_3$ and $\boldsymbol{C}_1$, $\boldsymbol{C}_2$, $\boldsymbol{C}_3$ are the same as equations (3) and (4).

4.2 Analytic Hierarchy Process (AHP)

This article chooses Analytic Hierarchy Process (AHP) [20] to construct an innovative model for urban retail business models. Analytic Hierarchy Process (AHP) was proposed by American

operations researcher Sati in the early 1970s. It is a decision-making method that combines qualitative and quantitative analysis. It is a classic algorithm that is commonly used in evaluation and data fusion. The calculation steps of AHP are as follows:

Step 1: Establish a hierarchical structure for business model innovation. According to the decision-making objectives, factors considered, and decision-making objects, divide them into the highest level, middle level, and lowest level based on their interrelationships, and draw a hierarchical structure diagram. Based on the logical relationships between the various elements of the business model innovation model, a suitable hierarchical structure is established, as shown in Figure 2. This article divides retail business model innovation into four levels.

In AHP, the hierarchical structure includes the top layer, middle layer, and bottom layer. The highest level is the purpose of decision-making or the decision-making principles for the problem to be solved. Here, it is the innovation of retail business models, represented by S1-S3. The middle layer refers to the factors to be considered and the criteria for decision-making, which includes both macro and micro factors. The third layer is the 11 main factors of the retail business model innovation model, represented by Ml-M11. The lowest level is the fundamental factor of business model innovation, represented by P1-P3.

Step 2: Construct a judgment matrix. Constructing a judgment matrix is the key to Analytic Hierarchy Process. If only the weights of different factors at each level are determined without qualitative analysis, the conclusions drawn will not have much persuasiveness. In the judgment matrix, the comparison results of two related factors are represented by numbers, and the strength is represented by the reciprocal of the numbers. The comparison results are usually obtained from historical data. Compare each scheme under a certain criterion pairwise and evaluate its level of importance.

Step 3: Sort the hierarchy and perform consistency checks. When sorting in hierarchy, it is necessary to calculate the eigenvector of the maximum eigenvalue of the judgment matrix and normalize it. First, perform hierarchical single sorting, and then perform hierarchical total sorting. After sorting, by searching for CI values and calculating RI values, the consistency ratio CR is calculated to determine whether the consistency test has been passed.

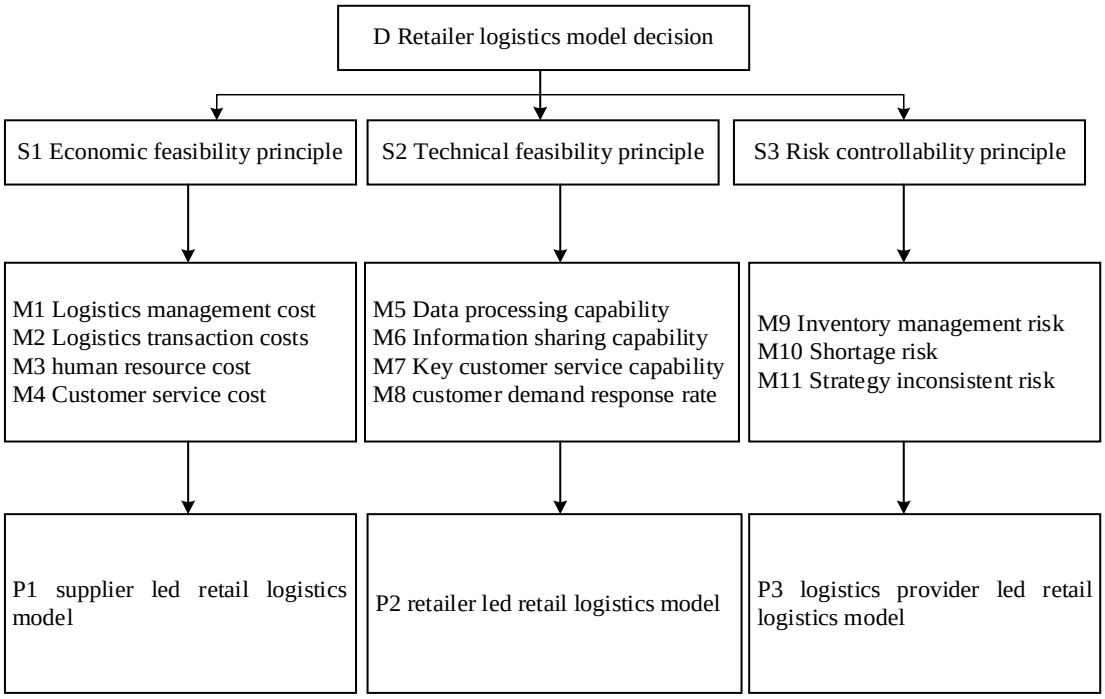

Figure 2: Hierarchical Structure Model for Retailer Business Model Innovation Selection

4.3 Improving the AHP Algorithm Framework

The improved AHP algorithm based on the comprehensive grey wolf optimization algorithm can ultimately obtain the parameters of the retail business model innovation model. The calculation process is shown in Figure 3.

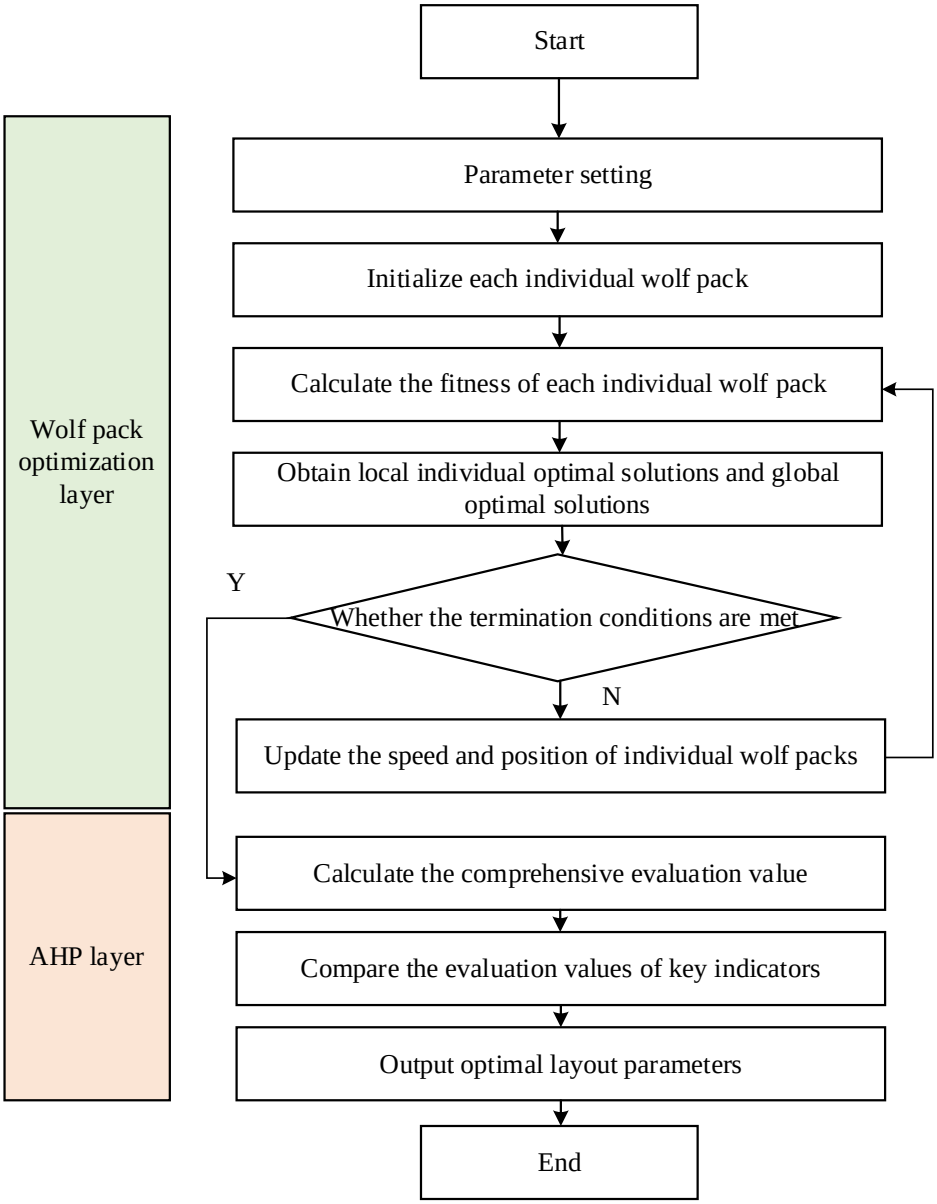

Figure 3: Grey Wolf Optimization AHP Solution Process for Retail Business Model Innovation Model

5 Empirical analyses

In order to facilitate decision makers in the selection of retail business model innovation models, the evaluation criteria layer and factors must have a clear structural relationship, and the following principles can be followed [21]: (1) The criteria layer and factors are representative to cover the important characteristics considered in the decision-making of retail business model innovation models; (2) The evaluation factors are operable; (3) The evaluation factors

are clear and specific, making them easy for experts and scholars to understand; (4) Considering time, manpower, and financial costs, the evaluation factors should not be too many.

The operational status of enterprises is mainly measured by financial indicators [22]. The level of key financial indicators represents the strength of the enterprise itself and determines its position in the industry. Under the principle of data availability, study listed retail enterprises; Under the principle of studying typicality, 15 enterprises with retail business revenue accounting for more than 30.5% of the group's operating revenue were selected. Based on the average annual reports of 15 companies from 2020 to 2024, analyze the operating conditions of representative enterprises in the retail industry using certain input-output indicators.

There are many academic studies on the operating conditions of enterprises, among which literature [23] analyzed the operating conditions of real estate listed companies; Reference [24] analyzed the operating conditions of tourism listed companies; Reference [25] conducted a study on the operational status of geographic information listed companies. Reference [26] analyzed the operational status of China's defense, aerospace, and military industry listed companies; Reference [27] studied the operating conditions of hotel listed companies. This article draws on relevant indicators for analyzing business conditions in existing research and selects evaluation indicators based on the characteristics of the retail industry. Therefore, output indicators are represented by monetary funds, fixed assets, and inventory, while input indicators are represented by sales expenses, management expenses, and liabilities.

In the process of empirical analysis, after consulting with relevant management personnel and consulting relevant literature, it was concluded that the input and output criteria are equally important. Therefore, the eigenvectors on the criterion layer are [0.5, 0.5], and the maximum eigenvalue is. Next, construct a judgment matrix for the sub criterion layer, as shown in Tables 1 and 2.

Table 1: Judgment Matrix of Output Sub criteria Layer

Standard 1	Monetary funds	Fixed assets	Inventory	Maximum eigenvalue	CI	CR
Monetary funds	1	5	2	3.0439	0.0267	0.0357
Fixed assets	1/2	1	3			
Inventory	1/5	1/3	1			

Table 2: Judgment Matrix for Input Sub Criteria Layer

Standard 2	Selling expenses	Administrative expenses	Liabilities	Maximum eigenvalue	CI	CR
Selling expenses	1	3	1/4	3.0326	0.0157	0.0718
Administrative Expenses	1/4	2	1/3			
Liabilities	4	1/2	1			

From Tables 1 and 2, it can be seen that the CR values of each judgment matrix are all less than 0.1, so it can be concluded that the judgment matrix meets the consistency test requirements. The corresponding weight scores and weight values were calculated using Yaahp10.3 software, as shown in Table 3.

According to the weight distribution in Table 3, the target layer "business status" is decomposed into two criterion layers, "output" and "input", with weights of 0.5 each, indicating that the study considers the output and input of business efficiency as equally important evaluation dimensions. Further analysis of the sub criterion layer weights reveals the following

characteristics: 1) Weight allocation for output indicators. Monetary funds (0.3185) have the highest weight, far exceeding fixed assets (0.1373) and inventory (0.0427), indicating that liquidity is considered a core indicator of a company's short-term solvency and operational flexibility. Fixed assets have the second highest weight (0.1373), reflecting their supportive role in the long-term operational stability of enterprises, but their importance is lower than that of monetary funds. The lowest inventory weight (0.0427) may be due to inventory turnover efficiency being included in other indicators (such as operational efficiency analysis in DEA), or research suggesting that its direct impact on the overall competitiveness of the enterprise is relatively small. 2) Weight allocation of input indicators. The weight of debt (0.3371) is significantly higher than that of sales expenses (0.0958) and management expenses (0.0642), indicating that debt structure contributes the most to the weight of business risk. High debt may increase financial costs, but it may also reflect a company's ability to leverage for expansion. The weight of sales expenses and management expenses is relatively low, possibly because research suggests that they are controllable costs and have a less significant impact on long-term competitiveness than liabilities and monetary funds.

Table 3: Distribution of Indicator Weights

Target layer	Criterion layer	Weight score	Sub criteria layer	Weight score	Weight value
Performance	Produce	0.5	Monetary funds	0.6382	0.3185
			Fixed assets	0.2726	0.1373
			Inventory	0.0857	0.0427
	Investment	0.5	Selling expenses	0.1914	0.0958
			Administrative expenses	0.1297	0.0642
			Liabilities	0.6657	0.3371

On the premise of consistent indicator dimensions, in order to reduce the differences in evaluation results caused by different indicator values among enterprises, this article takes the ratio of monetary funds, fixed assets, and inventory to operating income, and the ratio of sales expenses, management expenses, and liabilities to operating expenses as sample indicator values, and then uses weighted summation to obtain the AHP evaluation values of each enterprise, as shown in Table 4.

According to the AHP evaluation results in Table 4, there is a significant difference in the comprehensive scores of 14 retail enterprises. There is a clear gap in the evaluation values between the top 3 enterprises (Minsheng Jiale, Sanjiang Shopping, Wushanghang) and the lower ranked enterprises (Yonghui Supermarket, Xinbai Supermarket, Zhongbai Warehousing). The specific characteristics are as follows: 1) Significant advantages of top enterprises: Minsheng Jiale is far ahead with an evaluation value of 0.7791, and its weight contributions to indicators such as monetary funds (0.2405), fixed assets (0.0491), and liabilities (0.4523) are relatively high, indicating its outstanding performance in fund reserves, asset size, and debt management capabilities. Sanjiang Shopping (0.2267) and Wu Shangshang Selling (0.3421) closely follow, with the former performing well in monetary funds (0.0785) and inventory management (0.0035), while the latter is competitive in fixed assets (0.0481) and liabilities (0.2342). 2) The performance of tail enterprises is weak: the evaluation values of Yonghui Supermarket (0.1372), Xinbai Supermarket (0.1787), and Zhongbai Warehousing (0.1949) are all below 0.2, mainly due to insufficient monetary reserves (such as Yonghui Supermarket only 0.0309), high debt levels (such as Zhongbai Warehousing debt accounting for 0.1184), and low operational efficiency (such as Xinbai Supermarket management expenses accounting for 0.0007, but overall weight contribution is low). 3) The differentiation of intermediate

enterprises is obvious: Hualian Comprehensive Supermarket (0.3801), Andeli Shopping Center (0.3338) and other enterprises have evaluation values in the middle, but some indicators perform outstandingly (such as Hualian Comprehensive Supermarket's monetary capital ratio of 0.1356), indicating that they have local advantages but insufficient comprehensive competitiveness.

Table 4: AHP Evaluation Results and Ranking

Enterprise Name	Monetary funds	Fixed assets	Inventory	Selling expenses	Administrative expenses	Liabilities	AHP evaluation results	Sort
Wu discussed the sale of goods	0.0402	0.0481	0.0012	0.0117	0.0011	0.2342	0.3421	3
Minsheng Family Music	0.2405	0.0491	0.0180	0.0080	0.0046	0.4523	0.7791	1
Zhongbai Warehousing	0.0236	0.0271	0.0041	0.0137	0.0013	0.1184	0.1949	12
China Commerce Parity	0.0440	0.0215	0.0020	0.0004	0.0092	0.1614	0.2441	6
Bu Bu Gao Chain Supermarket	0.0234	0.0324	0.0043	0.0150	0.0002	0.1605	0.2413	7
HONGQI	0.0527	0.0214	0.0054	0.0210	0.0003	0.0985	0.2059	11
Xinbai Supermarket	0.0283	0.0232	0.0023	0.0114	0.0007	0.1073	0.1787	13
Bailian Shopping Center	0.0799	0.0324	0.0020	0.0134	0.0016	0.1705	0.3043	13
Hualian Comprehensive Supermarket	0.1356	0.0062	0.0041	0.0162	0.0004	0.2125	0.3801	5
Sanjiang Shopping	0.0785	0.0245	0.0035	0.0149	0.0002	0.1006	0.2267	2
Liqun Chain	0.0160	0.0299	0.0057	0.0075	0.0013	0.1454	0.2104	10
Yonghui Supermarket	0.0309	0.0087	0.0035	0.0130	0.0005	0.0760	0.1372	14
Andeli Shopping Center	0.0235	0.0582	0.0116	0.0101	0.0007	0.2243	0.3338	4
Jiajiayue Supermarket	0.0532	0.0137	0.0049	0.0148	0.0002	0.1206	0.2129	9

Analysis of driving factors for differences in AHP evaluation values. 1) The impact of weight allocation of financial indicators: Monetary funds, fixed assets, and liabilities are the core indicators in AHP evaluation, and their total weight may exceed 60%. For example, Minsheng Jiale's high weight in monetary funds and liabilities directly boosted its overall score, while Yonghui Supermarket's disadvantage in liabilities (0.0760) and monetary funds (0.0309) resulted in its ranking at the bottom. 2) The implicit role of operational efficiency indicators: Although sales expenses and management expenses are directly listed in Table 4, their weights may be low (such as less than 10% of the total proportion), resulting in limited contribution of operational efficiency to enterprise ranking. For example, the sales expenses (0.0210) of Hongqi Chain (0.2059) are relatively high, but their overall ranking has not significantly improved. 3) Limitations of subjective weight allocation: AHP evaluation results highly rely on experts' judgments of the relative importance of indicators. For example, if the debt indicator is given too high a weight, it may lead to companies with high debt ratios (such as Minsheng

Jiale) scoring falsely high; On the contrary, if the weight of operational efficiency indicators is insufficient, it may conceal the management advantages of some enterprises (such as the management expenses of BBK chain supermarkets accounting for 0.0002, but not significantly improving their ranking).

Limitation's verification of AHP evaluation results. 1) Comparison with industry benchmarks: Minsheng Jiale's debt ratio (0.4523) is significantly higher than the industry average (assuming 30%), but its AHP evaluation value still ranks first, indicating that the weight of debt indicators may be overestimated or the debt structure (such as the ratio of long-term debt to short-term debt) may not have been fully considered. 2) The contradiction between corporate strategy and evaluation results: Yonghui Supermarket takes fresh food supply chain as its core competitiveness, but implicit indicators such as inventory turnover rate and supply chain response speed are not included in the AHP evaluation, resulting in an underestimation of its comprehensive score. Similarly, the advantages of Hongqi Chain (0.2059) in community convenience services have not been fully reflected by the AHP indicator system. 3) Neglecting dynamic changes: AHP evaluation is based on static data and cannot reflect the dynamic changes of enterprises. For example, the proportion of monetary funds (0.1356) of Hualian Comprehensive Supermarket (0.3801) may increase due to recent financing activities, but long-term operational efficiency still needs to be verified.

6 Conclusion

Through literature review, based on theoretical analysis and AHP empirical analysis, the following conclusions are mainly drawn. Firstly, the innovation model of retail business models is influenced by the political and legal environment, economic environment, social and cultural environment, and technological environment at the macro level. Secondly, the social and cultural environment will have an immeasurable impact on the production and operation of commercial agglomeration enterprises. The key factors for innovation in retail business models include population size, consumer psychology, changes in lifestyle, cultural traditions and values, and social customs that influence consumer preferences. Thirdly, at the micro level, business model innovation is influenced by factors such as road traffic convenience, surrounding parking spaces and supporting facilities, shopping mall combinations, product cost-effectiveness, and personnel service quality.

Therefore, in order to improve business model innovation in urban retail business clusters, the following measures can be taken: from a political and legal perspective, the government can implement some continuous and stable preferential local policies, promote policies through laws and measures aimed at protecting consumers and the environment. From an economic and social perspective, the gathering place has a sustained and healthy level of economic development, a suitable socio-economic structure for market economy requirements, a huge population base, and market purchasing power, and the local economic development trend is good. From the perspective of business development, convenient transportation conditions and infrastructure, sufficient parking space and supporting facilities should be built near the gathering place to create a comfortable, safe, and enjoyable shopping environment for consumers. From the perspective of a retail store, appropriate store decoration, orderly and clearly arranged shelves and display cabinets, providing warm and thoughtful shopping services, ensuring product quality and safety, attractive cost-effectiveness, and improving the image and etiquette of service personnel.

The ultimate goal of business model innovation is to meet the needs of consumers, and companies need to spend a lot of effort researching and identifying the needs, purchasing motivations, and decision-making behaviors of different consumers. From a psychological

perspective, consumers' purchasing motivation is the desire to generate a certain demand due to external stimuli such as product price, good service attitude, reliable corporate credit, etc. When this desire is satisfied, the consumer's sense of happiness, satisfaction, and utility are maximally satisfied. Different utility, purchasing behavior, and psychology become key factors in marketing and product strategy.

Therefore, commercial enterprises should take the following measures in marketing and product strategy formulation: firstly, they should segment the market based on psychological variables such as consumers' lifestyle and personality. They can also segment the consumer market based on product usage, consumer loyalty to the store or brand, and consumer frequency of product use. Secondly, after selecting the self-labeled market, proceed to the next step of market positioning, such as positioning based on product attributes and benefits, positioning based on price and quality, and positioning based on product grade. Thirdly, design an effective marketing mix from product, market pricing, sales channels, and promotional methods to increase business model innovation for consumers. Product strategy can adopt product portfolio strategy, brand and trademark strategy, and product development strategy. Promotional combinations can be achieved through advertising and store promotion, such as trial products and gift giving, to attract consumers. Pricing should be based on segmented markets, different sales locations, and different versions of products to attract as many different consumers as possible.

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