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Evaluation of the Collaborative Development Capacity of the 'Industrial Brain' in the Context of New Quality Productivity

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Abstract

In the rapid development of the digital economy, China actively implements the policy of digital economy development, and takes digital transformation as the core engine to promote industrial upgrading and cultivate new productivity. As a new type of digital intelligence platform, 'industry brain' occupies a key position in the digital economy ecosystem, and plays a driving role in the integration of industrial chain resources and the interconnection of government and enterprise industry data. In this context, the 'beauty eyelash industry brain' in Shandong Province, based on the digital intelligence platform, to explore the potential for synergistic development, and become the core incubator to promote the transformation and upgrading of the traditional beauty eyelash industry to a new quality of productivity. In this regard, starting from the overall structure of 'Industry Brain', based on the literature, performance self-assessment reports and policy documents, we summarise and refine the evaluation index system of 'Industry Brain' synergistic development ability, which includes three dimensions of strategy, resources and organisation, and Comprehensively use the hierarchical analysis method and fuzzy comprehensive evaluation method to carry out in-depth assessment and accurately analyse the status of its synergistic development. The results show that the synergistic development capacity of 'Beauty Eyelash Industry Brain' is at a high level. Based on the evaluation results and the weight of the indicators, we focus on the five key elements with higher weights, namely, goal synergy, policy synergy, cultural synergy, financial synergy and management synergy, and dismantle the five elements from the governmental side and the enterprise side, and put forward the following recommendations The 'beauty eyelash industry brain' optimisation scheme helps the 'beauty eyelash industry brain' to be further improved, and points out the development direction for industrial integration and government-enterprise synergy.

Keywords

New Quality Productivity; Industrial Brain; Synergistic Development; Evaluation Index System; Collaboration between Government and Enterprises.

1. Introduction

In order to deeply implement the Party's 20th National Congress on "accelerating the construction of network power, digital China, accelerate the digital economy" strategic deployment, the State Council, "14th Five-Year Plan" Digital Economy Plan and other related documents, clearly pointed out that we should accelerate the deep integration of digital technology and the real economy. The State Council's "14th Five-Year Plan for Digital Economy" and other relevant documents clearly point out the need to accelerate the deep integration of digital technology and the real economy, and to cultivate the transformation of industries into

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new productivity. In this context, in view of the efficient integration of industrial chain resources and the urgent need for data interconnection between government and enterprises, "Industrial Brain", a new industrial chain digital intelligence platform came into being, and all provinces across the country have actively responded to the national policy to comprehensively promote the construction of the "Industrial Brain" platform in a number of industrial fields. The provinces across the country have actively responded to the national policy and comprehensively promoted the construction of the "industrial brain" platform in a number of industries. Among them, "Beauty Eyelash Industry Brain", as a provincial demonstration platform, captures industrial characteristics and helps the industry's digital transformation and upgrading. In order to deeply explore the potential value of the "industry brain", this paper provides a comprehensive analysis of the "beauty eyelash industry brain", starting from the overall structure and synergistic mechanism of the "beauty eyelash industry brain". Starting from the overall structure and synergistic mechanism of "Beauty Eyelash Industry Brain", combining with the current policies and existing research, this paper innovatively constructs the evaluation index system of synergistic ability of "Industry Brain", and uses hierarchical analysis to determine the weights of each index, and adopts the fuzzy comprehensive evaluation method in order to systematically evaluate and analyze the synergistic ability of "Beauty Eyelash Industry Brain". The fuzzy comprehensive evaluation method is used to systematically evaluate and analyze the synergistic ability of "Beauty Eyelash Industry Brain", and make suggestions on the synergistic ability of "Beauty Eyelash Industry Brain" from the synergistic key elements based on the evaluation results. It provides decision-making support on digital economy for the Beauty Eyelash Industry Brain, and provides a basis for its improvement and optimization, so as to more effectively promote the integration of the industrial chain and the process of digital transformation.

2. Literature Review

As a new trend in digitalization, the "industrial brain" platform marks a major breakthrough in the digital transformation of industries. Its collaborative capability plays a key role in promoting industrial chain resource integration and data sharing. Therefore, evaluating the synergistic capability of "industrial brain" is the trend of the current situation, and the research mainly focuses on "industrial brain" and the related aspects of synergistic capability.

2.1. Collaborative Platforms Research

Collaborative platforms represent an inevitable trend in digital development. Their digitalisation is achieved through technologies such as cloud computing and big data, enabling real-time aggregation of data across entire industrial chains [1] and facilitating interconnection of government and enterprise sector data. This digital platform also facilitates knowledge transfer, resource sharing, and the generation of innovative outcomes [2]. The ‘Industrial Brain’ constitutes a novel collaborative platform operating with data resources at its core. Spanning the entire product lifecycle, it fosters a service-oriented manufacturing ecosystem integrating production and services. Relying on the Industrial Internet, the ‘Industrial Brain’ integrates the four chains-industrial, supply, capital, and innovation-centred on data resources. It provides digital empowerment and services for enterprise operations and industrial ecosystem development.

The establishment of the ‘Industrial Brain’ constitutes the core of digital reform, signifying the advancement of industrial digitisation from ‘platform empowerment’ to the higher stage of ‘ecosystem construction’. Through the ‘Industrial Brain’ platform, the stability of industrial chains has been significantly enhanced, accelerating the development of advanced manufacturing bases while achieving cost reduction and efficiency gains. Building upon this foundation, the ‘Industrial Brain’ drives the coordinated development of industrial chains and

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the centralised integration of data elements, injecting powerful momentum into the nation's digital transformation process.

2.2. Research Related to Synergistic Capacity

The core mechanism of collaborative development is industrial chain synergy. Under appropriate institutional frameworks and incentive structures, this facilitates the evolution of industries from disordered states into modern industrial systems characterised by organic interconnections and mutual support. This process optimises four key dimensions-value chains, enterprise networks, supply-demand linkages, and spatial chains-ensuring seamless flow across upstream, midstream, and downstream segments. It promotes efficient circulation of factors and resource sharing between departments, thereby enhancing collaborative efficiency and reducing costs. Collaborative development can increase investment in innovation-related physical capital and human capital, as well as boost the output of innovative achievements, thereby advancing the upgrading of China's manufacturing sector within the global value chain. As an advanced digital platform, evaluating the collaborative development capabilities of the 'Industrial Brain' holds significant importance. On one hand, it enables deeper insights into the development trajectory of this digital platform, revealing its potential and challenges. On the other hand, by integrating and analysing data resources, it clarifies industrial development directions, providing robust support for constructing an efficient industrial division and cooperation system, thereby driving sustained innovation and prosperous development within the sector.

Scholarly research on digital collaborative development predominantly focuses on the integration of digitalisation and green transformation, with limited studies examining the impact of digital platforms like the 'Industrial Brain' on collaborative development. This paper will analyse the collaborative development capabilities of the 'Industrial Brain' from multiple perspectives, based on the overall architecture and internal mechanisms of the 'Beauty Eyelash Industry Brain'.

Collaborative development capacity, as the core enabler for driving multi-stakeholder value co-creation and overcoming developmental bottlenecks, has demonstrated its efficacy across multiple domains. Through case studies of spin-offs from software R&D, indicate that technological collaboration capabilities assist enterprises in integrating internal and external resources, breaking down technical barriers, and establishing technological advantages[3]. Research on the digital economy, technological innovation, and regional business environments indicates that synergistic development capabilities among these three elements can drive resource integration and factor mobility, forming positive feedback loops that activate endogenous regional economic momentum[4]. Examining supply chains, found this capability resolves conflicts between manufacturers and retailers during new product development, enhancing product-market fit through shared costs and risks[5]. Synergistic development between enterprises and customers can integrate clients into innovation processes, enabling precise demand capture to optimise product design[6]. Synergistic development between inclusive finance and SME financing reduces information asymmetry risks, providing SMEs with tailored financing services.Evidently, collaborative development capabilities have transcended micro-level enterprises and meso-level supply chains to influence macro-regional economies[7]. By dismantling resource barriers and optimising allocation efficiency, they achieve synergistic effects where '1+1>2', becoming a pivotal force driving innovation and development.

2.2.1. Hierarchical Analysis

(1) Constructing a judgment matrix

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$$A=\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} \quad (1)$$

According to the evaluation index system of "industrial brain" synergistic ability of beauty retail industry determined in this paper, establish a hierarchical analysis structure, compare the importance of the same level of indicators, and construct a judgment matrix. The value of a_{ij} in the matrix indicates the importance of Ai relative to Aj. If Ai is more important, it is expressed as $a_{ij}>1$, and if both are equally important, it is expressed as $a_{ij}=1$. The value of a_{ij} is expressed by 1 to 9 and its reciprocal, judgment matrix scaling rules as shown in Table 1.

Table 1. Judgment Matrix Scaling Rules

Scale	Meaning
1	Indicates that both factors are equally important
3	Indicates that the former of the two factors is slightly more important than the latter
5	Indicates that the former of the two factors is more important than the latter
7	Indicates that the former of the two factors is significantly more important than the latter
9	Indicates that the former of the two factors is definitely more important than the latter
2,4,6,8	Indicates that it is between two neighboring judgments
The inverse of the above value	If the importance between factor *i* and factor *j* is *Aij*, then the importance between factor *j* and *i* is *Aji*, *Aji* = 1/*Aij*

(2) Hierarchical ordering of items in a list

In the process of weight determination, to ensure the objectivity and accuracy of the results, a series of processing of the judgment matrix is required. Specific operational steps are as follows:

Step 1: Normalize the judgment matrix A: $\overline{a_{ij}}=a_{ij}/\sum_{i=1}^{n}a_{ij}(i,j=1,2,\cdots,n)$

Step 2: Sum the elements of each row of the judgment matrix A: $\overline{W_i}=\sum_{i=1}^{n}(i,j=1,2,\cdots,n)$

Step 3: Normalize $\overline{W_i}$ in the above equation: $W_i=\overline{W_i}/\sum_{i=1}^{n}(\overline{W_i}=1,2,\cdots,n)$

Step 4: Find its maximum eigenvalue and its eigenvector: $AW_i=\lambda_{\max}W_i$

(3) Consistency test

The consistency test is performed on the obtained vectors and eigenvalues: the largest eigenvalue $\lambda_{\max}$ is taken, and the consistency index(CI) is calculated by using the formula (2). Subsequently, take the ratio of consistency index(CI) and random consistency index value (RI), use the formula (3) to calculate the consistency test ratio(CR) ,if CR＜0.1, the judgment matrix is considered to have passed the consistency test， he judgment matrix is reasonable, which means that there is an explanatory value.

$$CI=\frac{\lambda_{\max}-n}{n-1} \quad (2)$$

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$$CR = \frac{CI}{RI} \tag{3}$$

2.2.2. Fuzzy Comprehensive Evaluation Method

The fuzzy comprehensive evaluation method transforms qualitative evaluation into quantitative results through fuzzy mathematical tools, providing a scientific and operational evaluation framework for complex systems. Its core lies in portraying uncertainty through the affiliation function and realizing multi-factor integration through hierarchical weight allocation, which is suitable for the scenarios with complex inter-indicator correlation and fuzzy evaluation data. This study combines the fuzzy comprehensive evaluation method with the hierarchical analysis method to assign weights to the indicators at all levels.

3. Construction of Evaluation Index System for Synergistic Ability of "Beauty and Eyelash Industry Brain"

Shandong Province "beauty eyelash industry brain" adheres to the concept of "leading, state-owned enterprises, market-oriented operation", and was selected as the provincial model "industry brain" in 2024. In view of this, this paper selects "Beauty Eyelash Industry Brain" as a case study to evaluate its synergy.

3.1. Overview of the Beauty Eyelash Industry Brain

The "beauty eyelash industry brain", relying on Pingdu's beauty and eyelash fashion industry chain special class leadership and support at all levels to build, has formed a set of relatively perfect service system "1+3+2+N", including an integrated service network, industry chain trading platform, industrial internet manufacturing platform, industry cluster ecological platform, industry cluster ecological platform, industry cluster ecological platform, industry cluster ecological platform, industry cluster ecological platform and industry cluster ecological platform. Internet manufacturing platform, industrial cluster ecological service platform three core platforms, technical support and security two support systems, as well as the transaction production, end-of-goods sales, internal management and other aspects of the services, from production to sales of the entire chain of digital management, to promote the production side and the consumer side of the seamless docking, to achieve the depth of the integration of the enterprise side and the side of the dynamic data display, analysis, monitoring for the industry to provide support. support.

3.2. Overall Structure of the Beauty Eyelash Industry Brain

Starting from the essence of "Industry Brain", as a data-driven platform, the core of "Industry Brain" lies in the integration and analysis of data, hitting the information barriers of the upstream, midstream and downstream of the industry chain, and realizing the optimal allocation of resources. The "Industrial Brain" digital platform adopts a layered architecture design, with each layer closely related and progressive, as shown in Figure 1.

Infrastructure layer serves as the underlying support, providing basic resources such as computing and storage to ensure stable data collection and transmission Data service layer builds multiple databases on this basis to realize data integration and management, providing data basis for subsequent analysis and decision-making. Platform service layer optimizes business processes and realizes data interaction between systems through workflow engine, API management and other functions. The operation function layer transforms the abstract architecture into concrete business scenarios such as production management and digital marketing. The user layer serves as the final interaction interface to complete the closed loop from data input to service output.

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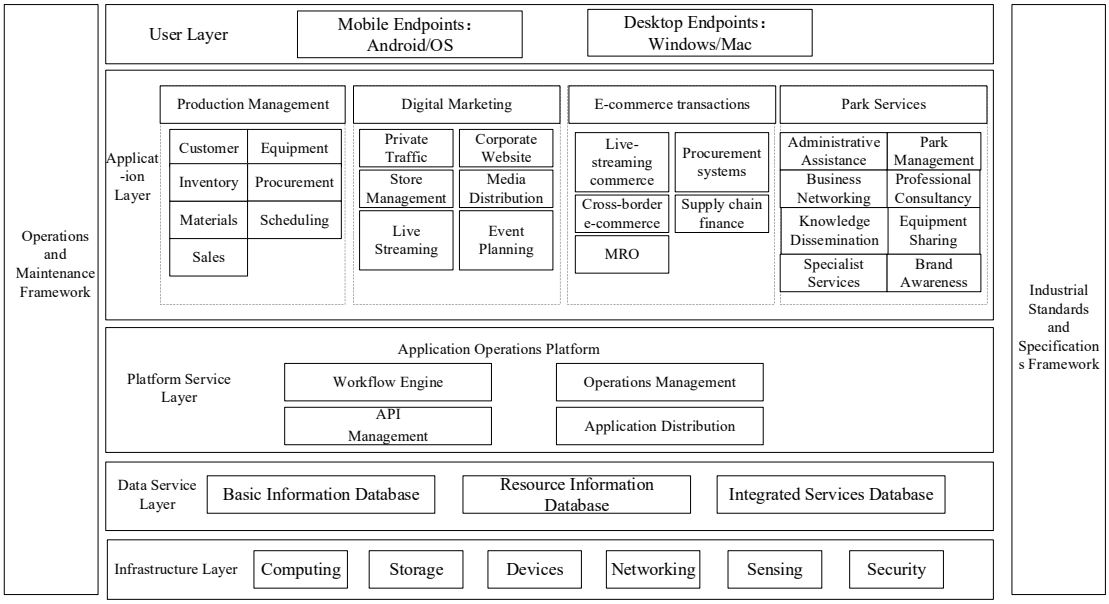

Figure 1. Overall Architecture of the 'Industrial Brain' Platform

This architectural design is essentially to realize efficient collaboration in the industry. From the mining of market demand data in the data service layer to the data-based strategy in the operation function layer, it embodies the precise control of market trends, enabling the industry chain to unify its strategic goals and guide its direction. The integration of all kinds of resource information by the infrastructure layer and data service layer and the reasonable deployment of resources by the platform service layer can realize the overall coordination of industry chain resources. The information sharing mechanism established in the platform service layer, together with the multi-subject collaboration module in the operation function layer, breaks the organizational boundaries and realizes the real-time communication between industrial chain subjects.

3.3. "Beauty Eyelash Industry Brain" Collaboration Mechanism

The synergistic mechanism of "Beauty Eyelash Industry Brain" is mainly developed from three aspects. By capturing market trend data, the "Beauty Eyelash Industry Brain" guides industry chain subjects to formulate new productivity-oriented strategic goals that meet market demand, accurately control market trends and industry direction, and realize strategic direction synergy. Through the mining of market demand data, it guides the raw material procurement strategy of upstream enterprises, the production strategy of midstream enterprises, and the market expansion strategy of downstream enterprises, so that production enterprises can advance their production plans and R&D enterprises can clearly define the direction of technological innovation, thus realizing the synergy of production, technology, and market goals. At the same time, the "beauty eyelash industry brain" can use digital technology to disseminate the culture and values of beauty enterprises, and promote the formation of a consistent value orientation and synergistic cultural atmosphere among the main bodies.

The "Beauty Eyelash Industry Brain" utilizes the data processing capability, the requirement of new quality production with data as the core driving factor, integrates all kinds of resources and information in the industrial chain, and provides all-round resource support for enterprises in different links of the industrial chain to realize the overall synergy of resources. According to the enterprise data provided by the platform, it can provide sufficient financial and technological resources for upstream raw material research and development enterprises and introduce high-end scientific research talents. Precisely formulate support policies to guide the flow of manpower and advanced production equipment resources to midstream production

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enterprises to improve production efficiency and products, and provide market information resources for the downstream to connect the key links of the industry chain, while knowledge sharing and technical cooperation can also be realized between enterprises through the platform to improve the efficiency of resource utilization.

The “Beauty Eyelash Industry Brain” establishes a digital collaboration platform for diverse stakeholders across the supply chain, transcending traditional organisational boundaries to redefine production relations. By implementing trust mechanisms and information-sharing protocols, entities can engage in real-time communication and collaborative work on the platform. Performance-based incentives are also pivotal to organisational synergy, enhancing employee trust and collaboration[8]. During new product development, brands, R&D firms and manufacturers can engage in real-time dialogue to promptly adjust formulations and production processes. When planning promotional campaigns, relevant enterprises can jointly devise strategies, share logistics data, and improve the identification of synergistic opportunities alongside the assessment of collaborative value. This facilitates the efficient integration of synergistic elements, achieving organisational coordination among diverse stakeholders.

Under the background of new quality productivity, strategic synergy, resource synergy and organizational synergy interact with each other to form the synergistic ability of "Beauty Eyelash Industry Brain". Strategic synergy plays a leading role in resource synergy, scientific strategic objectives can be based on the market, industry and policy conditions, clear direction of resource allocation[9]. At the same time, resource synergy counteracts the strategic synergy, the allocation and utilization of resources is an important basis for the formulation of strategic objectives, and its dynamic changes will also promote the optimization of strategic objectives. Resource sharing in resource synergy can promote the deepening of organizational synergy, sharing various types of resources can strengthen the cooperative relationship between different subjects, while the organizational structure is the key support for resource synergy, and a reasonable structure can make resources flow efficiently. In the relationship between strategic synergy and organizational synergy, strategic orientation can point out the direction for the optimization of organizational collaboration, and the organization will set up cross-departmental and cross-enterprise joint working groups and other optimized collaborations to achieve the strategic goals, while the efficiency of organizational collaboration is directly related to the implementation of the strategy, and the efficient collaboration can make the strategy come to fruition quickly.

3.4. Construction of Evaluation Index System of Synergistic Ability

Synergy theory explains that the interaction of subsystems within a complex system produces a synergistic effect beyond the simple superposition of individuals, and the system spontaneously forms a stable and orderly state in the spatial and temporal dimensions, and this principle is mapped to the economic and social fields, which is reflected in the synergistic process of multiple subjects through interaction, resource sharing and overall optimization in order to achieve specific goals. The synergistic ability of the digital platform "Beauty Eyelash Industry Brain" is centered on the platform, and through information integration and analysis, it realizes the interconnection and sharing of information resources between the upstream, midstream and downstream enterprises in the industrial chain as well as between the enterprises and each other, and ultimately achieves in-depth collaboration in terms of strategy, organization, resources, research and development, and talents. Based on the overall structure and synergistic mechanism of the "Beauty Eyelash Industry Brain", this paper adheres to the principles of systematic, scientific, hierarchical, and comparable, and combines the relevant literature, the "Industry Brain" performance evaluation reports and policy documents, and the "Industry Brain" with the "Industry Brain" in Shandong Province. Combining relevant literature,

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"Industrial Brain" performance evaluation reports and policy documents, and discussing with Shandong Province's "Industrial Brain" related departments, enterprise management and university experts, this paper organizes a series of relevant information from the data, and summarizes and extracts the relevant indicators through multiple research and discussions.

3.4.1. Extraction of Main Evaluation Indicators

Collecting experts' feedback to summarize and extract the indicators from the information, and the results are shown in Table 2.

Table 2. Extraction of Collaborative Development Capability Evaluation Indicators

Serial number	Information collation based on literature, performance self-assessment reports and policy documents	Summarize extracted indicators
1	Production link task arrangement, capacity matching and supply chain articulation synergy.	Synergy of production goals
2	Technology R&D direction planning, R&D resources integration and results sharing synergy.	Synergy of technical goals
3	Joint market development, market channel sharing and brand joint promotion synergy.	Synergy of market objectives
4	The degree of common recognition of the organization members on the enterprise vision, business philosophy and work value.	Consistent value proposition
5	The construction of a culture that encourages collaboration and sharing within the organization and among cooperative enterprises.	Synergistic culture atmosphere
6	The support for enterprise synergy through policies such as tax incentives, financial subsidies and project funding.	Policy support
7	The guiding role in industrial cluster planning, enterprise cooperation project matching and resource coordination.	Organizational guidance
8	The extent to which knowledge documents are shared and exchanged between departments within enterprises and between enterprises and enterprises.	Degree of knowledge sharing
9	The extent to which enterprises acquire knowledge from external sources and apply it to product improvement and process optimization.	Degree of knowledge transfer
10	The amount of output of the enterprise's achievements in generating new technologies, new methods and new business through innovative activities.	Degree of knowledge creation
11	The enterprise's cooperation and technology sharing in technology research, equipment upgrading, etc.	Technology cooperation and sharing
12	The enterprises' promotion of their own technologies to other enterprises in the industry, and the organization of technical exchange meetings, training and other activities.	Technology promotion and dissemination
13	The process and effect of enterprises' transformation of the introduced external technologies and transformation into their own productivity.	Technology absorption and transformation
14	The management mechanism of earmarking funds for the cooperative projects, independent accounting and preventing misappropriation of funds.	Degree of cooperative fund earmarking
15	Specific programs and implementation of the distribution of relational rent among cooperative enterprises based on the proportion of input and contribution.	Degree of relationship rent distribution
16	The degree of mutual trust and reliance generated by members of the organization based on past experiences in the course of cooperation.	Organizational member trust
17	The attitude of members within the organization to take the initiative to undertake and actively promote the synergistic project objectives and task arrangements.	Intra-organizational commitment attitudes
18	The sensitivity and judgment of the enterprise in capturing synergistic cooperation opportunities in market dynamics and industry trends.	Synergy opportunity identification degree
19	The method and result of assessing the value of synergy from the degrees of economic gain, brand enhancement and technology accumulation.	Synergy value assessment degree
20	The enterprise's overall arrangement, integration and utilization of human, material, financial and technological resources and other elements.	Degree of integration of synergistic elements

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In the end, the indicators extracted from the summary are further integrated into eight secondary indicators and three first-level indicators of strategic synergy, resource synergy and organizational synergy to construct the "Beauty Eyelash Industry Brain" synergy capacity evaluation index system, as shown in Figure 2.

The production target synergy, technology target synergy, market target synergy and other detailed indicators reflect the requirement that different subjects need to set up a unified target from the overall perspective. Different subjects need to set up unified goals from the height of the overall situation. The importance of forming a common vision and goal of cooperation from the perspective of value orientation and cultural level, which not only helps to unite the consensus of all parties, but also realizes the risk sharing and benefit sharing, and guarantees the stability and availability of synergy from the strategic height. Knowledge, technology, policy, capital and other related indicators, is the material basis and power source of synergy, reflecting the flow of resources and innovation among different subjects, is an important embodiment of the realization of resource sharing. The need to realize resource sharing among different subjects, and to achieve synergy of resources in daily production and operation by integrating key elements such as capital, technology, and knowledge in the industrial chain, so as to ensure that the overall benefit exceeds the sum of the benefits of each subject when it operates individually. Good organizational structure and relationship network can effectively enhance the synergy efficiency and, it is necessary to build a cross-organizational cooperation platform to provide an organizational carrier for the synergy between different subjects. This organization can enable the formation of equality, mutual assistance, and mutual trust between the subjects to promote the industry as a whole.

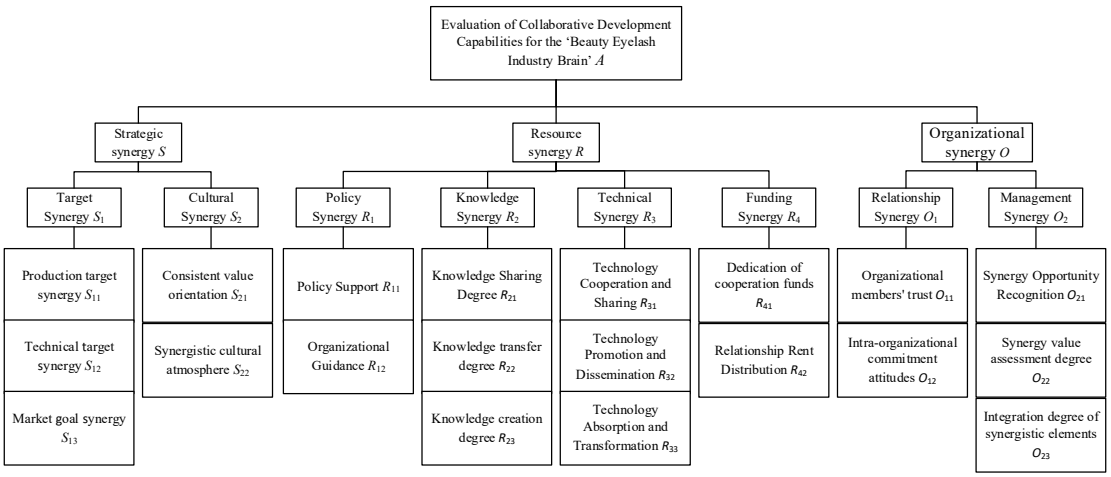

Figure 2. Collaborative Development Capability Evaluation System for the 'Beauty Eyelash Industry Brain'

3.4.2. Specific Description of Synergy Evaluation Indicators:

Strategic synergy S: The synergy of the "industrial brain" on the goals and culture within the industrial chain requires the leadership to aim at a long-term, global strategy in strategic decision-making, to form consistent values and a good synergistic atmosphere, and ultimately to realize the advantages of the industrial chain. Strategic synergy breakdown indicators are as follows:

Production target synergy S11: This indicator is used to reflect whether the "industrial brain" can accurately capture the dynamic matching needs of production and demand, so that the production and manufacturing links are effectively docked and efficiently operated, and the in-depth synergy of the industrial chain's production targets and overall optimization are realized.

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Technical Target Synergy S12: This indicator is used to reflect whether the "Industrial Brain" can connect the upstream and downstream of the industrial chain and different subjects, so that the technical research and development links have a unified direction, and the integrated technical resources are used to carry out collaborative work to achieve the consistent synergy of the industrial chain's technical objectives and promote the breakthrough, innovation and optimization of the industrial chain technology.

Market Goal Synergy S13: This indicator is used to reflect the optimization ability of the "industrial brain" to the pattern of slow market response, so that the market can respond quickly to capture the changes in consumer demand in a timely manner, so as to realize the effective connection between enterprises and consumers, and to promote the synergy of the industrial chain's market goals.

Consistent value orientation S21: Different subjects in their own process due to differences in positioning, resources, capabilities, etc., resulting in differences in the code of conduct or organizational culture, this indicator is used to reflect the influence of the "industrial brain" on the formation of consistent values.

Synergistic cultural atmosphere S22: This indicator is used to reflect the degree to which the "Industrial Brain" improves the communication efficiency, brings the subjects closer together through the communication link, enhances the degree of tolerance, understanding and trust among the subjects, realizes the corporate culture among the different subjects, and gradually forms a synergistic cultural atmosphere to make the industrial chain more cohesive as a whole.

Resource synergy R: "Industry brain" can realize the synergy of capital, technology, talents and other elements in the daily production and operation of the industrial chain through a variety of management methods and means, so that the industrial chain resources can be integrated and coordinated in accordance with efficient collaboration to create more value. Resource synergy segmentation indicators are as follows:

Policy Support R11: This indicator is used to reflect the effectiveness of the "Industrial Brain" in providing industrial information, formulating more targeted preferential policies through industrial information, providing financial support, strengthening infrastructure construction, creating a good environment for enterprises in the industrial chain, and reducing the operating costs and innovation risks of enterprises.

Organizational Guidance R12: This indicator is used to reflect the degree of promotion of "Industrial Brain" on the interconnection of government and enterprise industry data, to obtain enterprise data in the industry chain, to formulate industrial planning, to guide the direction of enterprise investment, to promote cooperation between industry, academia and research, to provide directional guidance for the industry chain, and to promote resource integration and complementary advantages between enterprises upstream and downstream of the industry chain.

Knowledge Sharing Degree R21: This indicator is used to reflect the degree of knowledge sharing on technology, market, management and other aspects of the "Industrial Brain". Knowledge interoperability among enterprises in the industrial chain helps break down the information barriers of enterprises and realize the optimal allocation of resources.

Knowledge transfer degree R22: This indicator is used to reflect the degree of knowledge transfer by the "industrial brain". Enterprises accept knowledge from other enterprises on the platform, acquire new technologies and management, and improve their own innovation ability and competitiveness, which helps to promote cooperation and communication between enterprises upstream and downstream of the industrial chain.

Knowledge creation degree R23: Reflecting the extent to which enterprises in the industrial chain are able to generate new knowledge through the cooperation of the "industrial brain", the

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knowledge stock of the organization is gained, and the rate of knowledge flow between organizations is promoted to enhance the knowledge flow.

Technology Cooperation and Sharing R31: This indicator is used to reflect the ability of enterprises in the industrial chain to cooperate through the "Industrial Brain" to jointly research and develop new technologies, products and services, thus realizing resource sharing and complementing each other's strengths, and contributing to the R&D costs and innovation risks of enterprises.

Technology Promotion and Dissemination R32: This indicator is used to reflect the ability of enterprises to apply new technologies, products and services to a wider range of fields and markets through technology promotion by "Industrial Brain", thus improving the market competitiveness and profitability of the whole industrial chain.

Technology Absorption and Transformation R33: Enterprises in the industrial chain need to have strong technology absorption and transformation capabilities, and this indicator is used to reflect the ability of enterprises to transform the introduced new technologies, products and services into their competitive advantages through the "Industrial Brain", which helps to improve the innovation capability of enterprises.

Dedication of cooperation funds R41: Dedication of funds refers to the funds invested for a specific cooperation. This indicator reflects the extent to which the Industrial Brain redeploys funds to the benefit of the industry, or the extent to which these funds can be used by other firms or individuals without affecting their original production value.

Relationship Rent Distribution R42: This indicator is used to reflect the distribution of excess profits (i.e., relationship rent) between two or more organizations that have generated more profits through the cooperation of the Industrial Brain than the sum of the profits they could have generated if they had operated independently.

Organizational synergy O: It refers to the ability of "Industrial Brain" to establish synergy between different subjects in the industrial chain beyond the general market transaction relationship, and to coordinate their cooperative relationship through close communication and shared management system. Organizational synergy segmentation indicators are as follows:

Organizational members' trust O11: the reliability of different subjects accumulated through interaction or based on each other's performance, this indicator is used to reflect the degree of trust of the participants in the data security of the "Industrial Brain".

Intra-organizational commitment attitudes O12: The psychological recognition and commitment of different subjects to the cooperative relationship, which is used to reflect the resources and over-investment contributed by the participants to enhance the risk-resistant capability of the "Industrial Brain".

Synergy Opportunity Recognition O21: Reflects the degree and ability of different subjects in the industrial chain to recognize the synergy opportunities through the information resources of the "Industrial Brain".

Synergy value assessment degree O22: refers to the assessment ability and judgment standard of different subjects in the industry chain on the synergy value. It is used to reflect the more accurate synergistic value assessment ability of the participants through the "industrial brain", so as to more accurately assess the value and effect of synergism and make more informed decisions.

Integration degree of synergistic elements O23: It is used to reflect the integration ability of synergistic elements among different subjects in the industrial chain through the "Industrial Brain", so as to realize the optimal allocation and efficient utilization of resources and promote industrial synergy.

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3.5. Determination of "Beauty Eyelash Industry Brain" Indicator Weights

This paper selects 15 "industry brain" related departments, corporate management and university experts, each expert independently scored the importance of the indicators, and then, the scoring results are discussed and summarized to obtain the target A judgment matrix shown in Table 3.

Table 3. Target A Judgement Matrix

Indicator name	Strategic synergy *S*	Resource synergy *R*	Organizational synergy *O*
Strategic synergy *S*	1.000 0	1.888 2	4.193 0
Resource synergy *R*	0.530 0	1.000 0	3.177 7
Organizational synergy *O*	0.238 5	0.314 7	1.000 0

According to the above steps and based on the judgment matrix the consistency test of expert scoring is obtained:

Maximum eigenvalue of the judgment matrix at the target level: $\lambda_{max} = 3.014\ 3$

Consistency Indicator: $CI = \frac{\lambda_{max} - n}{n-1} = \frac{3.014\ 3 - 3}{3-1} = 0.007\ 2$

Randomized consistency indicator value: $RI = 0.580\ 0$

Consistency test ratio: $CR = \frac{CI}{RI} = \frac{0.007\ 2}{0.580\ 0} = 0.012\ 3$

Since the CR is less than 0.1, the judgment matrix is considered to have satisfactory consistency.

Since the expert scoring passes the consistency test, the indicator weights can be calculated based on the scoring, as shown in Table 4.

ISSN: 2692-7608 DOI: 10.6981/FEM.202509_6(9).0012

Table 4. Weighting of Evaluation Indicators for Collaborative Development Capability of the 'Beauty Eyelash Industry Brain'

Objective Level	Primary Indicator	Weight	Secondary Indicator	Weight	Tertiary Indicator	Weight
Evaluation of Collaborative Development Capabilities for the 'Beauty Eyelash Industry Brain' A	Strategic synergy S	0.553 0	Target Synergy S_1	0.430 6	Production target synergy S_{11}	0.256 8
					Technical target synergy S_{12}	0.125 6
					Market goal synergy S_{13}	0.048 2
			Cultural Synergy S_2	0.122 4	Consistent value orientation S_{21}	0.095 7
					Synergistic cultural atmosphere S_{22}	0.026 6
	Resource synergy R	0.330 0	Policy Synergy R_1	0.149 9	Policy Support R_{11}	0.123 6
					Organizational Guidance R_{12}	0.026 3
			Knowledge Synergy R_2	0.042 3	Knowledge Sharing Degree R_{21}	0.020 5
					Knowledge transfer degree R_{22}	0.016 4
					Knowledge creation degree R_{23}	0.005 4
			Technical Synergy R_3	0.032 5	Technology Cooperation and Sharing R_{31}	0.004 2
					Technology Promotion and Dissemination R_{32}	0.018 7
					Technology Absorption and Transformation R_{33}	0.009 6
			Funding Synergy R_4	0.105 4	Dedication of cooperation funds R_{41}	0.083 1
					Relationship Rent Distribution R_{42}	0.022 3
	Organizational synergy O	0.117 0	Relationship Synergy O_1	0.029 3	Organizational members' trust O_{11}	0.023 1
					Intra-organizational commitment attitudes O_{12}	0.006 2
			Management Synergy O_2	0.087 8	Synergy Opportunity Recognition O_{21}	0.012 2
					Synergy value assessment degree O_{22}	0.051 4
					Integration degree of synergistic elements O_{23}	0.024 1

3.6. Analysis of Indicator Weighting Results

The weighting results of the evaluation index system of "Beauty Eyelash Industry Brain" show that strategic synergy occupies the most prominent position in the overall evaluation system, with a weight of 0.553 0. This result shows that strategic synergy is not only the most basic link in the synergy process of "Beauty Eyelash Industry Brain", but also a key factor that has a decisive influence on the whole, which ensures a high degree of consistency in the direction and goals of different subjects, providing a digital transformation for the industry. This result shows that strategic synergy is not only the most basic link in the synergy process of "Beauty Eyelash Industry Brain", but also a key factor that has a decisive impact on the whole, which ensures a

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high degree of consistency in the direction and goals of different subjects, and provides a clear path guide for the digital transformation of the industry. At the same time, the completeness of the resources of the "industrial brain" in terms of synergy is the most direct impetus to the industrial chain, so resource synergy also occupies a larger proportion in the evaluation system, with a weight of 0.330 0. Although organizational synergy accounts for a relatively small proportion of 0.117 0 in the weight distribution, it can ensure that the different subjects in the organizational structure, management process and communication mechanism are in the same direction and have a decisive impact on the whole. Although the organizational structure, management process and communication mechanism are relatively small, it can ensure the smooth connection of different subjects in the organizational structure, management process and communication mechanism, and provide organizational guarantee for the synergy of the "beauty eyelash industry brain", which plays an irreplaceable role in enhancing the overall synergy efficiency and effect.

At the second level of indicators, target synergy S1, policy synergy R1, cultural synergy S2, financial synergy R4 and management synergy O2 carry significant weight. This underscores their pivotal role in the coordinated development of the "beauty eyelash industry brain" synergy. Specifically, the weights for goal synergy S1 and cultural synergy S2 are 0.430 6 and 0.122 4 respectively, reflecting the importance of shared objectives and cultural consensus for the collaborative development of the "beauty eyelash industry brain". Goal synergy ensures high-level coordination among different entities in pursuing common goals. Cultural synergy strengthens the cohesion and centripetal force through shared values and concepts. The weights of policy synergy R1 and financial synergy R4 are 0.149 9 and 0.105 4 respectively. The high weights of these two indicators reflect the role of policy and financial allocation in the synergy of the "beauty eyelash industry brain". Policy synergy provides clear guidance and support for the industry, while financial synergy ensures effective allocation and efficient utilization of resources, providing a solid economic foundation for the industry and innovation. In addition, the weight of management synergy O2 is 0.087 8, which is relatively small compared to other indicators. But its role is equally critical. Management synergy focuses on the effective management of various subsystems or elements within the enterprise system, and enhances the overall synergistic efficiency and effect of the system through optimal combination and configuration. It emphasises the use of scientific management methods and tools to effectively achieve enterprise system synergy, thereby maximising the collaborative development of the ‘Beauty Eyelash Industry Brain’.

At the tertiary indicator level, production target coordination S11, technical target coordination S12, government policy support R11, aligned value orientation S21, and dedicated cooperative funding R41 account for 0.256 8,0.1256, 0.1236, 0.0957, and 0.0831. These indicators carry significant weight, forming the core elements of the collaborative development capability assessment for the ‘Beauty Eyelash Industry Brain’. They provide crucial reference for government guidance on industrial development direction. Reflecting the alignment of strategic objectives, policy and financial support, technological knowledge sharing, and harmonious organisational relations .In contrast, the weights for technology absorption and transformation R33, organisational commitment O12, knowledge creation R23, and technology cooperation and sharing R31 are all less than 0.01. Among these, technological cooperation and sharing having the smallest weight at 0.0042. Although these factors carry low weightings, their potential can be further unlocked through optimising technical cooperation mechanisms, enhancing internal organisational commitment levels, and strengthening knowledge creation and management. This approach will generate more comprehensive and enduring developmental momentum for enterprises within the practical operation and planning of the ‘Beauty Eyelash Industry Brain’.

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4. Evaluation of Collaborative Development Capabilities for the 'Beauty Eyelash Industry Brain'

Guided by the principle of 'government leadership, state-owned enterprise participation, and market-oriented operation,' Shandong Province's 'Beauty Eyelash Industry Brain' has been selected as a provincial-level demonstration 'Industry Brain' for 2024. In light of this, this paper selects the 'Beauty Eyelash Industry Brain' as a case study to evaluate its collaborative development.

4.1. Determining Fuzzy Comprehensive Evaluation Results

Table 5. Evaluation Results of Tier-3 Indicators for the Collaborative Development Capability of the 'Industrial Brain'

Objective Level	Primary Indicator	Secondary Indicator	Tertiary Indicator	Evaluation results r_{ij}				
				Excellent	Good	Average	Poor	Bad
Evaluation of Collaborative Development Capabilities of the Industrial Brain A	Strategic synergy S	Target Synergy S_1	Production target synergy S_{11}	0.910 7	0.053 6	0.035 7	0	0
			Technical target synergy S_{12}	0.875 0	0.071 4	0.053 6	0	0
			Market goal synergy S_{13}	0.910 7	0.053 6	0.035 7	0	0
		Cultural Synergy S_2	Consistent value orientation S_{21}	0.857 1	0.089 3	0.053 6	0	0
			Synergistic cultural atmosphere S_{22}	0.857 1	0.089 3	0.053 6	0	0
	Resource synergy R	Policy Synergy R_1	Policy Support R_{11}	0.857 1	0.107 1	0.035 7	0	0
			Organizational Guidance R_{12}	0.875 0	0.071 4	0.053 6	0	0
		Knowledge Synergy R_2	Knowledge Sharing Degree R_{21}	0.875 0	0.071 4	0.053 6	0	0
			Knowledge transfer degree R_{22}	0.875 0	0.071 4	0.053 6	0	0
			Knowledge creation degree R_{23}	0.875 0	0.053 6	0.053 6	0.017 9	0
		Technical Synergy R_3	Technology Cooperation and Sharing R_{31}	0.875 0	0.089 3	0.035 7	0	0
			Technology Promotion and Dissemination R_{32}	0.910 7	0.053 6	0.035 7	0	0
			Technology Absorption and Transformation R_{33}	0.839 3	0.071 4	0.089 3	0	0
		Funding Synergy R_4	Dedication of cooperation funds R_{41}	0.821 4	0.089 3	0.089 3	0	0
			Relationship Rent Distribution R_{42}	0.839 3	0.107 1	0.053 6	0	0
	Organiza -tional synergy O	Relationship Synergy O_1	Organizational members' trust O_{11}	0.875 0	0.071 4	0.053 6	0	0
			Intra-organizational commitment attitudes O_{12}	0.839 3	0.125 0	0.035 7	0	0
		Management Synergy O_2	Synergy Opportunity Recognition O_{21}	0.946 4	0.017 9	0.035 7	0	0
			Synergy value assessment degree O_{22}	0.875 0	0.071 4	0.053 6	0	0
			Integration degree of synergistic elements O_{23}	0.928 6	0.035 7	0.035 7	0	0

Based on the current development status of the 'Cosmetic Eyelash Industry Brain', management personnel from the Cosmetic New Economy Park, relevant enterprises within the park, and

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researchers involved in the construction and operation of the 'Industry Brain' were invited to score the three-tier indicators for collaborative development of the 'Cosmetic Eyelash Industry Brain'. A total of 130 questionnaires assessing the collaborative development capabilities of the 'Cosmetic Eyelash Industry Brain' were distributed, a total of 112 valid questionnaires were returned, yielding an effective recovery rate of approximately 86.15%. Employing the Fuzzy Comprehensive Evaluation Method, the evaluation indicators were categorised into five levels, with the judgement set defined as V={v1，v2，v3,v4，v5}={Excellent, Good, Average,Poor,Bad} and the corresponding score set as U={u1,u2,u3,u4,u5}={5,4,3,2,1}. The evaluation results for each indicator were obtained using Formula (4), where represents the membership degree of each evaluation criterion within the judgement r_{ij} set for the ith indicator, as illustrated in Table 5.

rij=Number of individuals selecting grade v in the i-th indicator/Number of participants in the evaluation (4)

4.2. Establishing the Fuzzy Comprehensive Evaluation Matrix

Using the data from Table 5, a judgement matrix corresponding to the grading indicators of the 'Beauty Eyelash Industry Brain' can be constructed. The fuzzy evaluation matrix for each level of indicator is derived using the product method, with the specific steps outlined below:

Step 1: Incorporate the secondary indicator weight matrix from Table 3 into the calculation to obtain the secondary indicator evaluation vector:

$$B = W \times R = [W_1, W_2, \cdots, W_n] \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1k} \\ r_{21} & r_{22} & \cdots & r_{2k} \\ \cdots & \cdots & \cdots & \cdots \\ r_{j1} & r_{j2} & \cdots & r_{jk} \end{bmatrix} \tag{4}$$

$$B_{S_1} = [0.5964 \quad 0.2917 \quad 0.1119] \begin{bmatrix} 0.9107 & 0.0536 & 0.0357 & 0 & 0 \\ 0.8750 & 0.0714 & 0.0536 & 0 & 0 \\ 0.9107 & 0.0536 & 0.0357 & 0 & 0 \end{bmatrix} = (0.9003 \quad 0.0588 \quad 0.0409 \quad 0 \quad 0)$$

By the same token, we can derive:

$$B_{S_2} = (0.8711 \quad 0.0893 \quad 0.0536 \quad 0 \quad 0) \qquad B_{R_1} = (0.8602 \quad 0.1008 \quad 0.0388 \quad 0 \quad 0)$$

$$B_{R_2} = (0.8750 \quad 0.0691 \quad 0.0536 \quad 0.0023 \quad 0) \qquad B_{R_3} = (0.8850 \quad 0.0634 \quad 0.0515 \quad 0 \quad 0)$$

$$B_{R_4} = (0.8252 \quad 0.0931 \quad 0.0817 \quad 0 \quad 0) \qquad B_{O_1} = (0.8674 \quad 0.0827 \quad 0.0498 \quad 0 \quad 0)$$

$$B_{O_2} = (0.8997 \quad 0.0541 \quad 0.0462 \quad 0 \quad 0)$$

Step Two: Calculate the evaluation vector for the primary indicator based on the evaluation vector for the secondary indicators and the weighting matrix for the secondary indicators:

$$B_S = W_S \times R_S = [0.7787 \quad 0.2213] \begin{bmatrix} 0.9003 & 0.0588 & 0.0409 & 0 & 0 \\ 0.8711 & 0.0893 & 0.0536 & 0 & 0 \end{bmatrix} = (0.8938 \quad 0.0655 \quad 0.0437 \quad 0 \quad 0)$$

$$B_R = W_R \times R_R = [0.4541 \quad 0.1282 \quad 0.0984 \quad 0.1393] \begin{bmatrix} 0.8602 & 0.1008 & 0.0388 & 0 & 0 \\ 0.8750 & 0.0691 & 0.0536 & 0.0023 & 0 \\ 0.8850 & 0.0634 & 0.0515 & 0 & 0 \\ 0.8252 & 0.0931 & 0.0817 & 0 & 0 \end{bmatrix} = (0.8534 \quad 0.0906 \quad 0.0556 \quad 0.0003 \quad 0)$$

$$B_O = W_O \times R_O = [0.250 \quad 0.750] \begin{bmatrix} 0.8674 & 0.0827 & 0.0498 & 0 & 0 \\ 0.8997 & 0.0541 & 0.0462 & 0 & 0 \end{bmatrix} = (0.8916 \quad 0.0613 \quad 0.0471 \quad 0 \quad 0)$$

ISSN: 2692-7608 DOI: 10.6981/FEM.202509_6(9).0012

Step 3: Calculate the fuzzy comprehensive evaluation vector for target A:

$$B_A = W_A \times R_A = \begin{bmatrix} 0.553\,0 & 0.330\,0 & 0.117\,0 \end{bmatrix} \begin{bmatrix} 0.893\,8 & 0.065\,5 & 0.043\,7 & 0 & 0 \\ 0.853\,4 & 0.090\,6 & 0.055\,6 & 0.000\,3 & 0 \\ 0.891\,6 & 0.061\,3 & 0.047\,1 & 0 & 0 \end{bmatrix} = \begin{pmatrix} 0.880\,2 & 0.073\,3 & 0.048\,0 & 0.000\,1 & 0 \end{pmatrix}$$

4.3. Calculation of Composite Scores and Analysis

The final score for the collaborative development capability of the 'Beauty Eyelash Industry Brain' was determined using Formula (6). The scores for each level of indicator evaluation are presented in Table 5:

$$F = B \times U \tag{5}$$

$$F_A = B_A \times U = \begin{bmatrix} 0.880\,2 & 0.073\,3 & 0.048\,0 & 0.000\,1 & 0 \end{bmatrix} \begin{bmatrix} 5 \\ 4 \\ 3 \\ 2 \\ 1 \end{bmatrix} = 4.838\,4$$

Table 6. Summary of Evaluation Values for Collaborative Development Capability Indicators of the 'Beauty Eyelash Industry Brain'

Objective Level	Evaluation Value	Primary Indicator	Evaluation Value	Secondary Indicator	Evaluation Value
Evaluation of Collaborative Development Capabilities for the 'Industrial Brain' A	4.838 4	Strategic synergy S	4.862 1	Target Synergy S_1	4.859 4
				Cultural Synergy S_2	4.873 5
		Resource synergy R	4.796 8	Policy Synergy R_1	4.820 6
				Knowledge Synergy R_2	4.816 8
				Technical Synergy R_3	4.833 1
				Funding Synergy R_4	4.743 5
		Organizational synergy O	4.844 5	Relationship Synergy O_1	4.817 2
				Management Synergy O_2	4.853 5

Table 6 indicates that the 'Beauty Eyelash Industry Brain' demonstrates a high level of collaborative development capability, with all primary indicator evaluation values consistently stabilising around 4.8. This data confirms the 'Industry Brain' possesses a high degree of collaborative development proficiency. Specifically, it has fostered highly aligned strategic collaborative objectives internally, with all entities acting in concert around this shared goal, thereby generating a powerful synergy effect. Moreover, the 'Beauty Eyelash Industry Brain' possesses precise resource allocation capabilities.This ensures resources are effectively directed to areas of greatest need, maximising their value. Concurrently, through a tightly integrated communication and shared management system, this 'Industry Brain' coordinates cooperative relationships among all entities, achieving holistic organisational synergy. Regarding secondary indicators, the evaluation scores for cultural synergy and objective

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alignment within the 'Industry Brain' demonstrate higher values. This indicates that the eyelash industry utilises the platform to unify development goals, enhance communication between different entities, and achieve the integration of corporate cultures across participants. Management synergy ranked third in evaluation value, demonstrating that unified management of enterprise subsystems or elements via the platform enables participants to identify collaborative opportunities through its information resources. This facilitates more accurate assessment of synergistic value and more efficient integration of collaborative elements. Conversely, the lowest evaluation value was recorded for financial synergy, indicating shortcomings in the platform's allocation of funds regarding dedicated cooperation and excess distribution.

5. Research Conclusion and Recommendations

5.1. Research Conclusion

Against the backdrop of new-quality productive forces development, the 'Industrial Brain'-as a novel digital integration platform for industrial chains-plays a pivotal role in advancing government-enterprise collaboration and SME synergy within the cosmetics retail sector. It has emerged as the core incubator driving the transformation and upgrading of traditional cosmetics and eyelash industries towards new-quality productive forces. Based on the aforementioned evaluation findings, the study's content is summarised in two aspects:

(1) Within the collaborative development capability evaluation framework for the 'Beauty Eyelash Industry Brain', strategic synergy, resource synergy, and organisational synergy interact to jointly shape and enhance the collaborative development potential of the industry's 'Industry Brain'.Strategic synergy serves as the target alignment for new quality productive forces, forming an invisible bond between government, enterprises, and the industry. Within the cosmetics and eyelash sector, diverse entities-from brand owners and manufacturers to distributors-establish efficient communication and collaboration mechanisms through the 'Industry Brain.' Strategic synergy not only lays the foundation of trust and cooperation for organisational synergy but also charts a clear course for the industry's future development.Organisational synergy facilitates the restructuring of new-quality production relations, further solidifying the communication and organisational foundations for strategic synergy. It also provides robust organisational safeguards for the deepened application of the 'Industrial Brain' digital platform. The ultimate purpose of achieving both strategic and organisational synergy is to drive resource coordination within the industry, constructing an efficient system for resource flow and utilisation.Among the secondary indicators, the five key elements of objective coordination, policy coordination, cultural coordination, financial coordination, and management coordination occupy the top five positions. This highlights the crucial role of multidimensional coordination in enhancing overall effectiveness. These elements complement each other, collectively providing a clear developmental direction for optimising the 'Beauty Eyelash Industry Brain.' Continuous refinement of these critical elements can further enhance the collaborative development capabilities of the 'Beauty Eyelash Industry Brain.'

(2) This paper employs the Analytic Hierarchy Process (AHP) and Fuzzy Comprehensive Evaluation Method to assess the collaborative development capacity of Shandong Province's 'Beauty Eyelash Industry Brain', concluding that its overall performance in this regard is satisfactory.

Consequently, this paper clarifies the weightings of each indicator within the evaluation framework and applies them to assess the collaborative development capacity of the 'Beauty Eyelash Industry Brain,' thereby providing theoretical and practical foundations for its future advancement.

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5.2. Research Recommendations

This paper focuses on five key elements with higher weighting: objective coordination, policy coordination, cultural coordination, financial coordination, and management coordination. Integrating the evaluation results, it deconstructs these five elements from both governmental and corporate perspectives. Targeted optimisation proposals for the 'Beauty Eyelash Industry Brain' are formulated, providing deployment support for its overall development and driving comprehensive advancement and refinement.

5.2.1. Achieving Strategic Consensus and Cultural Synergy to Foster Long-Term Development of the Cosmetic Eyelash Industry

To ensure unified goal alignment among all entities within the cosmetic eyelash industry chain, it is imperative to establish a long-term, holistic strategic consensus and actively pursue transformation towards new-quality productive forces.Government should play a leading role by organising multi-stakeholder strategic seminars for the beauty eyelash industry chain. This will consolidate consensus on the long-term development of the 'Beauty Eyelash Industry Brain' and clarify phased objectives. Such unified goals not only guide leadership in making informed strategic decisions but also foster deep synergy across multiple facets including raw material supply, production processing, technological R&D, and market sales.Raw material suppliers can utilise market data analysis from the 'Industry Brain' to accurately gauge trends, proactively liaise with manufacturing enterprises, and ensure stable supply of specific eyelash materials for the coming year. Manufacturing enterprises should optimise production processes, enhance quality and efficiency based on market feedback and platform data. Sales enterprises must develop detailed online channel expansion plans and set market share growth targets to achieve deep upstream-downstream synergy.

Enterprises should thoroughly understand the overall planning and objectives of the 'Beauty Eyelash Industry Brain' initiative, actively participate in strategic discussions and decision-making processes, clarify their positioning and role within the industrial chain, and offer constructive suggestions. Regarding cultural synergy, the government can host industry forums and seminars, while promoting the establishment of trade associations or alliances to enhance mutual understanding and trust among stakeholders, thereby improving communication efficiency.Enterprises should strengthen internal staff awareness of collaboration, actively participate in various activities, and enhance connections and communication with other entities in the industrial chain to jointly advance the in-depth development of the 'Beauty Eyelash Industry Brain' initiative.

5.2.2. Refining Policy Frameworks and Funding Allocation to Guide Beauty Eyelash Enterprises' Participation

The development of the 'Beauty Eyelash Industry Brain' should be grounded in the government's resource integration objectives, leveraging policy instruments to drive platform expansion and growth through the consolidation of local government support measures. At present, the digital transformation of China's beauty eyelash SMEs remains in its nascent stages.Due to concerns over corporate data security and privacy protection, most micro, small, and medium-sized enterprises exhibit limited motivation and willingness to join the 'Beauty Eyelash Industry Brain' platform. The government's credibility endorsement can provide safeguards for the platform's development. By refining government support policies for the 'Beauty Eyelash Industry Brain' and enhancing data security regulations, trust in the 'Industry Brain' can be bolstered.The government may proactively introduce and implement specialised policies for the digital transformation of the eyelash industry. Measures such as subsidies for digital equipment procurement and tax incentives for technological R&D can tangibly reduce enterprises' transition costs. Concurrently, strengthening data security regulatory frameworks

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and clarifying data usage standards will foster a secure and reliable data environment for businesses, thereby enhancing the trust foundation for inter-enterprise data sharing.

Concurrently, the government may explore diverse financing models, facilitating corporate access to capital through streamlined loan approval processes and reduced interest rates. This approach tangibly lowers financing costs and enhances capital efficiency. A dedicated development fund, termed the 'Cosmetic Eyelash Industry Hub,' could be established to directly support platform-critical R&D and infrastructure development. Financial institutions should be encouraged to develop tailored financial products, broadening corporate financing avenues. Enterprises, in turn, should fully leverage the government's supportive policy resources.Building upon government resource integration with industrial funds, local industrial capital should be combined with external social capital. Equity financing can be leveraged to mobilise additional resources, providing financial backing for strategic implementation and business expansion to drive corporate growth and value enhancement. The 'Beauty Eyelash Industry Brain' may also forge deep collaborations with banks, non-bank financial institutions, and fintech companies in supply chain finance. This partnership aims to co-create financial products covering the entire industry ecosystem and benefiting enterprises of all scales, thereby resolving financing challenges within the supply chain.

5.2.3. Strengthening Management Coordination Mechanisms to Achieve a Virtuous Cycle of Resource Utilisation and Feedback in the Beauty Eyelash Industry

The government should strengthen collaborative management mechanisms by establishing a 'cosmetic eyelash industry brain' management coordination system. This will facilitate information sharing and collaborative oversight among all entities within the industrial chain. Collaborative management standards must be formulated to clarify the responsibilities and obligations of each participant, ensuring smooth and efficient coordination. Furthermore, enhanced monitoring and evaluation of the industrial chain's subsystems are required. Prompt identification and resolution of issues will elevate the overall efficiency of the system's collaborative operations.

Different entities within the industrial chain must enhance internal coordination management to promote information sharing and collaborative cooperation across departments. This will assist the 'Beauty Eyelash Industry Brain' in accurately capturing data, providing richer and more precise information resources. A virtuous cycle of resource utilisation and feedback should be established. This will furnish enterprises with a basis for measuring the value and effectiveness of collaborations, enabling decisions more conducive to industrial development. Regarding technological innovation, enterprises should proactively invest in digital technology R&D and equipment upgrades.They should actively participate in various industry events, sharing experiences and exchanging resources with peers to collectively foster a favourable innovation environment, thereby propelling the efficient development of the 'Beauty Eyelash Industry Brain'.

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