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Exploring the Organic Integration Path of Applied Talent Cultivation Mode and Civic and Political Education in the Corn Industry Cluster in the New Era

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SUMMARY: *The development of applied talents in the corn industry cluster during the new era is a comprehensive effort involving various interactions of multiple factors. Precise determination of the critical influencing factors forms the essential prerequisite for promoting talent development in this specific area. Using the DEMATEL approach, this paper measures the effects of each factor and determines the core influencing factors. Based on the core factors, this paper analyzes the questionnaires relevant to the examples of applied talent cultivation in the new-era corn industry cluster using the combination of non-competitive analysis (NCA) and fuzzy-set qualitative comparative analysis (fsQCA). The results show that the core influencing factors include government, industry, education and research, quality assessment, cooperation and exchanges, and capital support. The configuration analysis finds no necessity, and there are four talent cultivation pathways, which can be classified into three models, namely "Strong Habitual Type," "Domain-Habitual Type," and "Habitual-Balanced Type." This research provides a valuable reference to facilitate the deep integration of applied talent cultivation and civic-political education in the corn industry cluster.*

KEYWORDS: *DEMATEL method; NCA; fsQCA; talent cultivation; civic and political education*

1 Introduction

Today's society is the era of knowledge economy and informationization, education and science and technology is an important driving force for social development, the state supports the development of education as a priority in all undertakings. Higher education institutions, as the main participant of science and technology projects and knowledge innovation, have the unshirkable task of cultivating innovative talents and application-oriented talents needed by the society [1]. In this historical process, the food industry as a basic industry to protect people's livelihood, the process of high-quality development of the food industry will require a large number of innovative talents [2]. As an important food crop and diversified industrial raw materials, corn industry faces multiple structural problems such as insufficient extension of industrial chain, low value-added products, low level of scientific and technological application, and weak degree of industrial organization, and urgently needs to build a systematic upgrade path [3-5]. Corn industry not only has significant economic functions, but also carries profound farming cultural values, carrying rich cultural connotations in regional symbols, folk festivals and farmland landscape [6]. Therefore, to promote the corn industry and the dual drive of

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applied personnel training, through the “hard conditions” and “soft elements” of the dual path, will become a key path to crack the corn industry upgrading predicament, and promote the value chain to the high-end leap.

In the process of transformation of traditional agriculture to modern agriculture, the systematic upgrading of the corn industry not only relies on the reconstruction of technology, systems and other “hard conditions”, but also requires the embeddedness and transformation of “soft factors” such as specialized talents [7-9]. However, the current corn industry-related personnel training system is out of touch with the practical needs, insufficient innovation ability, low industrial clustering, and insufficient professionalism of employees [10-13]. Simple skills training can no longer meet the comprehensive requirements of industrial clusters for talents, and it is urgent to explore an innovative training model that is more in line with the reality of the industry and emphasizes both practical ability and value leadership [14, 15]. The idea of grand ideology and politics shifts vocational education away from being just a form of education imparting technical skillset to a multi-dimensional and synergistic form of education involving the creation of knowledge system, formation of predominant way of thinking, vocational ethics, and other dimensions [16-18]. In addition, the present age, which sees the prevalence of individualistic tendencies among university students, diversity of information, and more sophisticated ideologies, makes it even more difficult for values to form [19]. In the context of the high-quality development of applied personnel training in corn industry, there is a need for ideological and political education to be part of the whole training process, promote the deep integration of ideological and political education into professional teaching, and create a new comprehensive personnel training ecosystem that is multidimensional and tripartite.

Previous studies have investigated the determining factors of applied talent cultivation from various angles. Nevertheless, most of them have mostly analyzed individually certain determinants or a few selected determinants, so there is no comprehensive study of the synergetic relationship between several factors. In the research setting, where the focus is on the development of the new era corn industry cluster, the current study uses the DEMATEL technique to efficiently detect causal relations between different influential factors and their interaction processes as well as the degree of importance. Next, in order to evaluate the necessity of singular conditioning factors, the fsQCA technique is combined with the NCA method that allows for measuring the necessity level of each condition thanks to its quantitative capability. Combining NCA and fsQCA methods increases the robustness of clustering. The method of data collection includes the use of questionnaires, while an empirical test includes examples.

2 Talent training mode of industry-teaching integration in corn industry cluster

2.1 Factors affecting the cultivation of talents for industry-education integration

On the basis of previous research results, this paper discusses the influencing factors of talent cultivation of industry-teaching integration in corn industry cluster. The influencing factors of industry-teaching integration talent cultivation in corn industry cluster include government, industry-academia research, curriculum system, teaching mode, teacher construction, cooperation and exchange, organization guarantee, quality evaluation and capital support.

Politics, industry, academia and research is an important external support and mechanism guarantee to promote the effective operation of the system, through resource sharing, complementary roles and mechanism linkage, to jointly build the ecosystem of industry-education integration, which is the key force to promote the optimization of the talent supply structure of the maize industry cluster and industrial upgrading.

In terms of effective cultivation for the integration of industry and education in the corn industry cluster, the cultivation of the faculty of the university and protective measures must be established through the establishment of a relatively reasonable faculty composition, instructional techniques, and curricula as critical elements. Faculty composition includes many aspects. Firstly, it includes the ratio of instructors with entrepreneurial experiences. It involves the number of teachers with entrepreneurial background within the university. This background enables the enrichment of the contents taught and helps facilitate the spread of the concept of entrepreneurship. Secondly, it is related to the ratio of instructors with professional training experiences. Professional training experience refers to teachers with some kind of formal education training. Instructors who have gained professional training experience are able to be more efficient teachers; thus, their work helps spread the concept of entrepreneurship and facilitates the understanding of this concept by the learners. Thirdly, the correct use of instructional technique and attitude by educators is a necessary condition for the success of such cultivation. Teachers need to take into account that students are the subjects of education and thus have responsibilities toward their students, which is an important aspect of talent development in the corn industry cluster integration. Lastly, it involves the innovative ability of teachers, including the formation of educational theory and social entrepreneurship activities.

The instructional strategy and curricular structure for the corn industry cluster include cultivation goals, core course percentage, practical course percentage, and second classroom construction. Cultivation goals refer to the direction and base for the development of talent under the perspective of industry-education integration in the corn industry cluster. Core course percentage implies the proportion of core courses in the total curriculum. This is an important factor that affects the matching degree between talent cultivation and integrated education-industry. Therefore, the curriculum must be well-balanced. Practical course percentage refers to the proportion of practical courses in the total curriculum. Practical-oriented talent cultivation for the industry-education integration in the corn industry cluster means transforming theory into practice based on the theoretical basis. Second classroom includes the structured training activities like theme seminar, professional project competition, and club activity that enrich the cultivation of talent within the framework of industry-education integration and stimulate their entrepreneurship vitality.

2.2 Analysis of factors influencing talent development based on DEMATEL

What influencing factors are involved in the training of talents for industry-education integration in the maize industry cluster, and what is the correlation and influence relationship between them, which is an important issue to be faced and broken through in this study.

2.2.1 DEMATEL methodology

The DEMATEL method can effectively identify the causal relationship between factors and has been widely used in the study of the interaction between factors of complex systems and the importance of each factor. The basic steps based on the DEMATEL model are as follows:

Step 1: Construct the system indicator element set

Identify the research indicators or research elements according to the research purpose and construct the indicator element set. Construct the indicator element set of evaluation of applied talents training in the new era corn industry cluster, and note that the indicator element set is

$C_1, \cdots, C_n$.

Step 2: Establish the initial direct influence matrix A

There is a direct influence matrix $A\left(A = \left[a_{ij}\right]_{n\times n}\right)$, where A is an n-order matrix with 0 diagonal elements, of the following shape:

$$A = \begin{bmatrix} 0 & a_{12} & \cdots & a_{1n} \\ a_{21} & 0 & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & 0 \end{bmatrix} \tag{1}$$

where the element $a_{ij}\left(i = 1, 2, \cdots, n,\ j = 1, 2, \cdots, n, i \neq j\right)$ denotes the degree of direct influence of the indicator C_i on the indicator C_j. The direct impact matrix is determined by the opinions and information of experts and scholars in the field related to the research problem and the heads of functional departments, and is generally obtained by means of a research questionnaire, which can be measured on a 5-point Likert scale. The initial direct impact matrix is generally determined by averaging the evaluator's ratings for the direct impact situation between indicators.

Step 3: Establishing the normalized direct influence matrix S

There is a normalized direct influence matrix $S\left(S = \left[s_{ij}\right]_{n\times n}\right)$, with normalization coefficients λ, and the following computational equation:

$$\lambda = \frac{1}{\max\limits_{1\le i\le n} \sum_{j=1}^{n} a_{ij}} \tag{2}$$

$$S = \lambda A = \frac{1}{\max\limits_{1\le i\le n} \sum_{j=1}^{n} a_{ij}} A \tag{3}$$

For any element in the normalized direct influence matrix S, $0 \le s_{ij} \le 1$ is satisfied.

Step 4: Calculate the integrated impact matrix T

Given an integrated impact matrix $T\left(T = \left[t_{ij}\right]_{n\times n}\right)$, and noting that I is the unit matrix, T can be computed as follows:

$$T = S\left(I - S\right)^{-1} \tag{4}$$

The combined impact matrix further indicates the combined effect of direct and indirect influences among the elements, and the value of each element t_{ij} in the matrix scales the degree of combined influence of indicator C_i on indicator C_j. The combined impact matrix can be used to further analyze the relationship between the impacts of the indicators.

Step 5: Calculate the degree of influence and the degree of influence of each element of the indicator.

The degree of influence and the degree of being influenced of the indicator element C_i are e_i, f_i respectively, and have the following calculation formula:

$$e_i = \sum_{j=1}^{n} t_{ij}, \left(i = 1, 2, \cdots, n\right) \tag{5}$$

$$f_i = \sum_{j=1}^{n} t_{ji}, \left(i = 1, 2, \cdots, n\right) \tag{6}$$

The degree of influence e_i measures the combined influence of the indicator element on the rest of the indicators, the larger its value means the more significant influence on the rest of the indicator elements; similarly, the degree of being influenced f_i measures the extent to which the indicator element is influenced by the rest of the indicators.

Step 6: Calculate the centrality and causality of each indicator element

The centrality and causality of the indicator elements are m_i, n_i, and have the following calculation formula:

$$m_i = e_i + f_i, \left(i = 1, 2, \cdots, n\right) \tag{7}$$

$$n_i = e_i - f_i, \left(i = 1, 2, \cdots, n\right) \tag{8}$$

The centrality m_i reflects the centrality of the indicator element in the indicator set, this centrality is reflected in the existence of a wide range of influencing and being influenced by other elements, a high degree of centrality means that the indicator element is in a relatively central position; the cause degree n_i can be used to differentiate between the cause factor and the result factor, and the larger the value proves that the cause factor has a higher degree of influence, and the smaller the value proves that it is influenced by the degree of influence is higher.

2.2.2 DEMATEL analysis of factors affecting talent development

In order to understand the experts' views on the relationship and degree of influence among the above eight factors, this study designed an interview questionnaire, using the more commonly used scale of 0 to 4 (indicating “no influence” to “very high influence”) for scoring judgment. Numbers X1~X8 are government, industry, academia and research, curriculum system, teaching mode, faculty building, cooperation and exchange, organization and guarantee, quality evaluation and capital support, respectively. Since it is necessary to clarify the mutual influence relationship and degree between two factors (set as $X\mathrm{i}$, $X\mathrm{j}$) (depending on the factor has no influence on itself), the questionnaire's questions are designed in such a way that the questions cover not only the measure of the influence relationship and degree of the factor $X\mathrm{i}$ on the factor $X\mathrm{j}$, but also the measure of the influence relationship and degree of the factor $X\mathrm{j}$ on factor $X\mathrm{i}$ influence relationship and degree of measure. In the survey, the interviewed experts can assess the influence relationship and degree between factors $X\mathrm{i}$ and $X\mathrm{j}$ based on their own experience and knowledge advantage. As such, after the design of the questionnaire, a small-scale pilot testing and revision were made. In order to make the survey easy to be implemented and to reflect the research problem properly, the interviewees are people familiar with the issue of developing the application ability of talents in higher education institutions with regard to the government, industry, society, and academia in the G region. Altogether, there are 320 questionnaires sent out, from which 278 were returned and thus a return rate of 86.88%. These valid data were roughly representative in that each of the four aspects, including government, industry, society, and higher education contributed to the total sample about 17%, 18%, 19%, and 23% (and college and university students also contributed to 23%), respectively. A direct relations matrix was made; only one of which is shown below. The direct relation matrix of the factors related to talent cultivation with regard to industry-education integration in the corn industry cluster can be seen in Table 1. From the results, it is evident that government, industry, academia, and research (X1) have a great impact on the development of the faculty (X4) and little impact on capital support (X8), with matrix element 1,3 equaling 3, and 1,8 equaling 1. Capital support (X8) has no effect on itself, so the matrix element 8,8 equals 0, among others.

Table 1: Influence factor direct relationship matrix

Code	X1	X2	X3	X4	X5	X6	X7	X8
X1	0	3	3	2	2	2	2	1
X2	1	0	3	2	1	1	1	1
X3	1	3	0	3	3	2	2	1
X4	1	2	3	0	1	1	2	3
X5	0	1	2	2	0	2	2	2
X6	1	1	3	3	1	0	1	3
X7	2	1	3	2	1	1	0	2
X8	1	1	1	1	1	2	1	0

The average value of all the direct relationship matrices was calculated, taking into account that there was no weight assigned to any of the experts involved in this study. The resulting total relationship matrix is given in Table 2. In addition, the influence index for the influential factors and the ranking of these factors were also calculated, with the result presented in Table 3. Lastly, the causality matrix for the influential factors was constructed, which can be viewed in Figure 1. To highlight important information, only the first three ranked factors are shown and labeled as key influential factors in Table 4.

Table 2: Complete relationship matrix

Code	X1	X2	X3	X4	X5	X6	X7	X8
X1	0.05297	0.14497	0.13399	0.13703	0.12396	0.10202	0.15599	0.15797
X2	0.08206	0.06103	0.10501	0.12100	0.10401	0.08403	0.11901	0.12495
X3	0.07501	0.11999	0.04999	0.12502	0.10105	0.08199	0.10500	0.12100
X4	0.06205	0.09699	0.08600	0.05603	0.09003	0.07398	0.09800	0.11400
X5	0.09596	0.12101	0.10596	0.11801	0.07100	0.10901	0.13204	0.14397
X6	0.06096	0.07805	0.07603	0.08206	0.10704	0.04700	0.09493	0.09897
X7	0.09000	0.10501	0.08801	0.12502	0.11804	0.10805	0.08800	0.16900
X8	0.06902	0.10003	0.07598	0.11402	0.09501	0.08096	0.12507	0.08505

Table 3: The impact factors are integrated and the index and the sort

Code	Influence degree	Sort	Be affected degree	Sort	Center degree	Sort	Reason degree	Sort
X1	1.00890	1	0.58803	8	1.59693	5	0.42087	1
X2	0.80110	4	0.82708	4	1.62818	4	-0.02598	4
X3	0.77905	5	0.72097	6	1.50002	7	0.05808	3
X4	0.67708	7	0.87819	3	1.55527	6	-0.20111	7
X5	0.89696	2	0.81014	5	1.70710	3	0.08682	2
X6	0.64504	8	0.68704	7	1.33208	8	-0.04200	6
X7	0.89113	3	0.91804	2	1.80917	1	-0.02691	5
X8	0.74514	6	1.01491	1	1.76005	2	-0.26977	8

Table 4: Talent training key factors

Sort	Influence degree	Be affected degree	Center degree	Reason degree
1	X1	X8	X7	X1
2	X5	X7	X8	X5
3	X7	X4	X5	X3

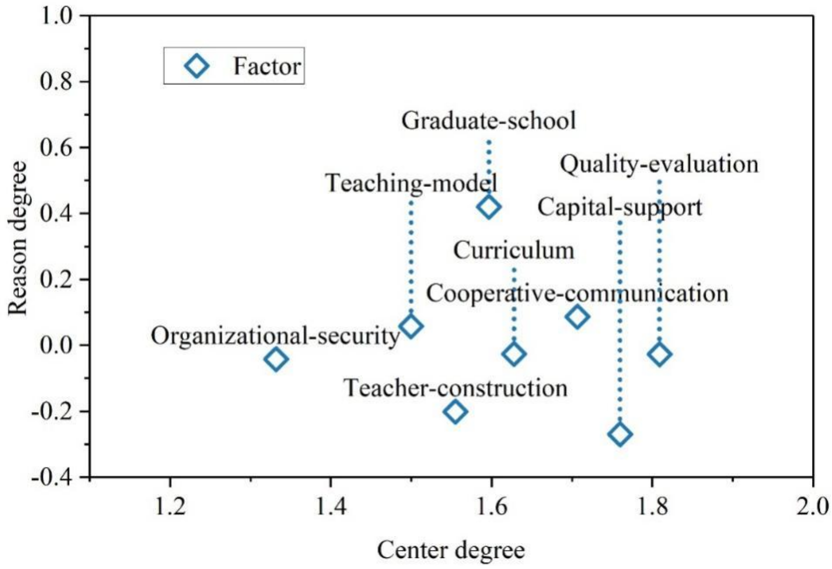

Figure 1: Influence factor causality matrix diagram

3 Synergistic Path of Talent Cultivation by Industry-Education Integration in Corn Industry Cluster

3.1 Study design

3.1.1 Qualitative comparative analysis of fuzzy sets

The term Qualitative Comparative Analysis (QCA) refers to a family of approaches which lie somewhere between qualitative and quantitative research methods. It should be noted that QCA provides an opportunity for case study research and statistical analysis of variables; moreover, it is based on the configuration approach, which allows studying multiple conditions or causations. Thus, QCA is appropriate for exploring complex effects caused by the interaction of various conditions.

In this section, the method of qualitative comparative analysis (QCA) will be used to study the main factors affecting the integration of industry and education in terms of training applied talents in the corn industry cluster in the new era. It is noted that the training of applied talents is a complicated and systemic dynamic process where the key determinants include the major players, the inputs of resources, academic counseling, and internship training, and all of them have mutual impact on each other. Therefore, the combination of several factors determines the efficiency of the industry-education integration in the process of applied-talent training program implementation. It is evident that QCA is particularly useful in dealing with complicated issues because it allows analyzing the relationship between the antecedent factors and the result in consideration of their complexity.

The qualitative comparative analysis approach can be further categorized into three types depending on the characteristics of the variables employed: crisp set QCA (csQCA), multi-valued QCA (mvQCA), and fuzzy set QCA (fsQCA). Based on the impact of the different aspects on industry-education interaction in applied talent development and considering that there is a fuzzy interaction effect, where simple binary categorization (0 or 1) is not sufficient, but continuous measurement is needed, it is difficult to describe the magnitude of the effect with the use of the 0-1 range.

After calibrating the data, the sufficiency of the condition variables must be examined. In QCA, the sufficiency of each condition variable is evaluated based on consistency and coverage.

The formula for consistency is as follows (X is the condition variable and Y is the outcome variable):

$$Consistency\left(X_i \le Y_i\right) = \sum\left[\min\left(X_i, Y_i\right)\right] \Big/ \sum X_i \tag{9}$$

The measure of consistency is used for determining whether the condition variable is necessary. A high value of consistency demonstrates the sufficiency of the condition variable, which requires that its value should be above 0.9.

On the other hand, coverage is used for measuring the practical importance of the condition variable. Coverage measures how important a necessary condition is for the outcome variable and is calculated using the equation below:

$$Consistency\left(X_i \le Y_i\right) = \frac{\sum\left[\min\left(X_i, Y_i\right)\right]}{\sum Y_i} \tag{10}$$

Higher values of coverage indicate more empirical significance of the necessary condition and better explanation of the dependent variable. However, as already stated earlier, none of the conditional variables used in this paper is mandatory for the success of the industry-teaching partnership program, and thus there is no need for any further coverage analysis.

3.1.2 Research models

Based on the findings of the grounded research, this study derives eight complementary mechanisms that constitute industry-education integration from the case studies of the corn industrial cluster in the new era. It discusses the meanings behind each of these mechanisms before developing a conceptual model to explain industry-education integration and applied talent cultivation. From the results of preliminary investigation and case study analysis, it can be shown that when measuring how a program for high performance in industry-education integration could be achieved through applied talent cultivation, the influence of each single element cannot be solely examined but the common influence must be considered through grouping.

3.1.3 Questionnaire design and data collection

In this current research, data were mainly gathered through two ways in gathering data on case information and survey data. These include case information distribution and questionnaires. As the corn industry cluster-industry education integration project is still at the developmental and exploratory stage, most of the projects conducted by the industry and educational organizations have not yet been compiled into comprehensive summaries. Therefore, this research assumes that questionnaires will be the first source of data while case information will serve as the secondary data source. In detail, the principal data will be gathered through the questionnaire survey while case information will be employed to crosscheck the data from the questionnaire survey due to familiarity with the case. The process of questionnaire survey is as follows:

The process of questionnaire design is as follows: first of all, the basic framework of the questionnaire is built on the basis of the results of the previous rooted research; at the same time, the content and expression of the questions in the existing related research are referred to, and the first draft of the questionnaire is formed; secondly, the expression problems existing in the first draft of the questionnaire are carefully revised in order to avoid the occurrence of illogicality and ambiguity of the meaning of the questionnaire and to facilitate the research object to be able to accurately grasp the questionnaire during filling it out. Once again, the author's research team members were asked to fill out the questionnaire as subjects, and in the process of filling out the questionnaire, the author answered the questions and recorded the suggestions of the subjects in a timely manner; then, the questionnaire was revised one by one in response to the problems pointed out by the subjects, and so on for several times until the simulated subjects no longer have questions about the questionnaire; finally, the questionnaire instructions were added to clarify the purpose of the questionnaire survey and reduce the number of questions and the number of questions. Finally, the questionnaire description is added to clarify the purpose of the questionnaire survey to the filler, so as to reduce the defense psychology of the filler and improve the effect of filling out the questionnaire.

The questionnaire used in this study consists of two main parts: ten basic information items and forty-six measuring items. The basic information items are used to describe the general background of the integration between industries and education on both sides participating in the process, concentrating on size and type. The measuring items are meant for assessing the motives, behaviors, and constraints faced by both sides in their interaction in industries and education, as well as to measure the overall success of the whole process. In order to improve the reliability of the responses, and reduce the convergent response behavior, a four-point Likert scale was used in this research. Responses from the participants were divided into four groups, which include very nonconformable, rather nonconformable, rather conformable, and very conformable.

Because of the concerns regarding data reliability and availability, the participants of the research were chosen as the heads of either the school sector or the enterprise sector among the industry-education integration scheme. The project leaders of either side of such projects usually have an excellent insight into the preconditions, circumstances during implementation, and post-condition of the project, as they design and carry out such programs of industry-teaching integration. The involvement of those leaders in answering the questionnaire can reflect real industry-teaching integration for the training of practical talents.

Questionnaire collection took place mainly between December 2023 and January 2024 using offline paper-based questionnaires and online electronic questionnaires.

A total of 80 questionnaires were obtained. Because of the strict requirement of data in fsQCA, an elimination process was used to filter out any invalid responses, namely, responses that had no sufficient detail, showed a systematic pattern, or indicated any discrepancy in each question compared with the information collected by the researcher in terms of cases. In total, 25 invalid questionnaires were filtered out, leaving 55 valid questionnaires with a validity rate of 68.75%.

3.2 Analysis of findings

3.2.1 Necessary condition analysis based on NCA approach

The purpose of necessity analysis is thus dual, on one hand, it aims at determining the presence of a certain condition as being necessary for the realization of the outcome variable, and on the other hand, to establish to what extent the necessary condition should be realized in order to reach a certain level of the outcome. While uniconditional necessity analysis in QCA answers to the first problem, NCA can solve both issues, namely the necessity conditions in QCA and the requisite level of necessity for certain outcome levels. It means that using NCA for necessity condition analysis in QCA leads to more solid and thorough study conclusions. NCA provides researchers with two methods of necessity test, which are called ceiling regression (CR) and ceiling envelope (CE). In the current study, the results of both approaches are reported. Namely, the outcome of NCA necessity analysis is summarized in Table 5, wherein the considered conditional variables are named X1-X8: government, industry, academia, research, curriculum system, teaching mode, faculty construction, cooperation and exchange, organization and guarantee, quality evaluation, and capital support, correspondingly. In general, only the curriculum system variable is significant. Nonetheless, while CR and CE show different magnitudes of effect (both approximately 0.1), it means that all these variables are insufficient for necessary conditions for development of applied talents in the maize industry cluster in the new era. Moreover, the other conditional variables are also found to be insignificant, which means that they are not necessary conditions for development of talents in the maize industry cluster in the new era.

Table 5: The NCA is necessary to analyze the results

Conditional variable	Method	Accuracy	Ceiling zone	Range	Effect quantity	P
X1	CR	100/%	0.000	1	0.000	1.000
	CE	100/%	0.000	1	0.000	1.000
X2	CR	100/%	0.055	0.66	0.085	0.008
	CE	100/%	0.111	0.66	0.166	0.008
X3	CR	100/%	0.000	0.66	0.000	1.000
	CE	100/%	0.000	0.66	0.000	1.000
X4	CR	100/%	0.168	1	0.164	0.297
	CE	100/%	0.332	1	0.332	0.297
X5	CR	100/%	0.000	1	0.000	1.000
	CE	100/%	0.000	1	0.000	1.000
X6	CR	100/%	0.000	1	0.000	1.000
	CE	100/%	0.000	1	0.000	1.000
X7	CR	100/%	0.112	1	0.112	0.236
	CE	100/%	0.225	1	0.223	0.236
X8	CR	100/%	0.000	1	0.000	1.000
	CE	100/%	0.000	1	0.000	1.000

Because of the wider applicability of the CR technique in relation to the empirical situation in the current research paper, in this case, a systematic report on the results derived through the application of the NCA bottleneck analysis using the CR technique is presented. The bottleneck-level results concerning the NCA technique can be found in Table 6 below, where it can be seen that there is no existence of any bottleneck level within the conditional variables, except the curriculum system, faculty building, and quality evaluation. Within these three conditional variables, 100% of talent cultivation would require 50.6%, 32.6%, and 67.5% of the three respective levels.

Table 6: Analysis results of the NCA method bottleneck level

Talent culture	X1	X2	X3	X4	X5	X6	X7	X8
0	NN	NN	NN	NN	NN	NN	NN	NN
10	NN	NN	NN	3.2	NN	NN	NN	NN
20	NN	NN	NN	6.5	NN	NN	NN	NN
30	NN	NN	NN	10.0	NN	NN	NN	NN
40	NN	NN	NN	13.3	NN	NN	NN	NN
50	NN	NN	NN	16.6	NN	NN	NN	NN
60	NN	NN	NN	19.9	NN	NN	NN	NN
70	NN	4.7	NN	23.0	NN	NN	6.5	NN
80	NN	20.2	NN	26.7	NN	NN	26.3	NN
90	NN	35.2	NN	29.8	NN	NN	46.8	NN
100	NN	50.6	NN	32.6	NN	NN	67.5	NN

3.2.2 Single Conditional Variable Analysis

In order to ensure robustness, this study further relies on the operational steps of mainstream QCA research, and adopts the single conditional variable analysis of QCA to test the necessary conditions, and this study takes the values of 8 conditional variables positively and negatively, and obtains 16 conditional variables to unfold the test, and the analysis results are shown in Table 7.

Scores related to the consistency of all condition variables with both positive and negative values do not exceed 0.9, and this corresponds to the outcome of the study conducted by NCA. In other words, none of the variables representing an individual condition can be regarded as a necessary condition to cultivate the applied-talent at a high level in the cluster of the corn industry in the new epoch. Additionally, one should note that cultivation of the applied-talent in the corn industry cluster is managed by a complicated mechanism with several causative factors.

Table 7: Analysis of single variable variables

Conditional variable	Consistency	Coverage
X1	0.592385	0.733925
~X1	0.514588	0.632451
X2	0.785241	0.764125
~X2	0.294954	0.497215
X3	0.784451	0.690421
~X3	0.295412	0.610325
X4	0.730295	0.730345
~X4	0.349278	0.563325
X5	0.541215	0.488541
~X5	0.459485	0.894512
X6	0.730958	0.628155
~X6	0.322541	0.705641
X7	0.785253	0.674321
~X7	0.241451	0.529621
X8	0.592354	0.646124
~X8	0.487854	0.691921

3.2.3 Conditional configuration analysis

In this research work, the truth table is inserted in the fsQCA 3.0 software to carry out the conditional group-state analysis. In this research, the consistency value was fixed at 0.8, the PRI consistency value at 0.7, while the case frequency was fixed at 1. Three types of solutions were produced by the software which are complex, intermediate, and parsimonious, where each solution includes a different logical residual as the main point of difference.

Table 8: Conditional configuration analysis results

Solution type		Original coverage	Net coverage	Consistency
Complex solution/ intermediate solution	~X1*X2*X3*X4*~X5*X7*~X8	0.162889	0.054298	1
	~X1*X2*X3*X4*~X5*X6*X7	0.162889	0.054298	1
	X1*X2*~X3*~X4*~X5*X6*X7*~X8	0.0810375	0.0275526	1
	X1*X2*X3*X4*~X5*~X6*X7*X8	0.134526	0.054298	1
	Total coverage	0.325778	Total consistency	1
Simple solution	~X5*X7	0.379258	0.379258	1
	Total coverage	0.379258	Total consistency	1

To clearly and intuitively reflect the roles of each condition variable in the configuration, this study distinguishes core conditions from marginal conditions by combining intermediate solutions and simplified solutions. Condition variables that appear in both the intermediate solution and the simplified solution are classified as core conditions, while condition variables that only appear in the intermediate solution but not in the simplified solution are classified as marginal conditions. The final results are presented as shown in Table 9. In the table, ● or ● indicates the presence of the condition variable in the path, ⊕ or ⊕ indicates the absence of the condition variable in the path, and "blank" indicates that the existence of the condition variable for that path is irrelevant; ● or ⊕ represents core conditions, and ● or ⊕ represents marginal conditions.

In total, there are four configuration paths of applied talent cultivation in the new era corn industry cluster. The consistency value of both individual and aggregate configuration solutions is 1. It means that the four configuration paths can be considered as a sufficient-condition combination associated with a high level of applied talent cultivation in the new era corn industry cluster. In other words, all the cases of applied talent cultivation in the new era corn industry cluster matching the four configuration paths will have, at most, a 100% presence of a high level of talent cultivation. In terms of coverage, the overall coverage of the configuration solution is around 0.325778, which means that the number of cases studied in this paper comprises more than one-third of the causal complex paths. Coverage for the four configuration paths varies between 0.08 and 0.17; the net coverage for each of these paths is positive. Based on the results obtained in four configuration paths, the following analysis of cases is performed by path.

Table 9: The condition group state of the talent culture

Conditional variable	Configuration solution			
	Path 1	Path 2	Path 3	Path 4
X1	⊕	⊕	●	●
X2	●	●	●	●
X3	●	●	⊕	●
X4	●	●	⊕	●
X5	⊕	⊕	⊕	⊕
X6		●	●	⊕
X7	●	●	●	●
X8	⊕		⊕	●
Consistency	1	1	1	1
Original coverage	0.162889	0.162889	0.0810375	0.134526
Net coverage	0.054298	0.054298	0.0275526	0.054298
Total consistency	1			
Total coverage	0.325778			

Based on the empirical analysis discussed above and case studies, a system model for the advanced development stage of the application of talent development within the corn industrial cluster is established in the new era. The pathway typology model for such a system is illustrated in Figure 2 below. In this diagram, the horizontal axis shows the level of importance given to habitual factors, while the vertical axis shows the level of importance given to field factors. On the other hand, the intensity of darkness of the bottom portion of the grouped pathway model indicates the level of importance attached to capital factors, where the more the darkness, the more capital-intensive it is.

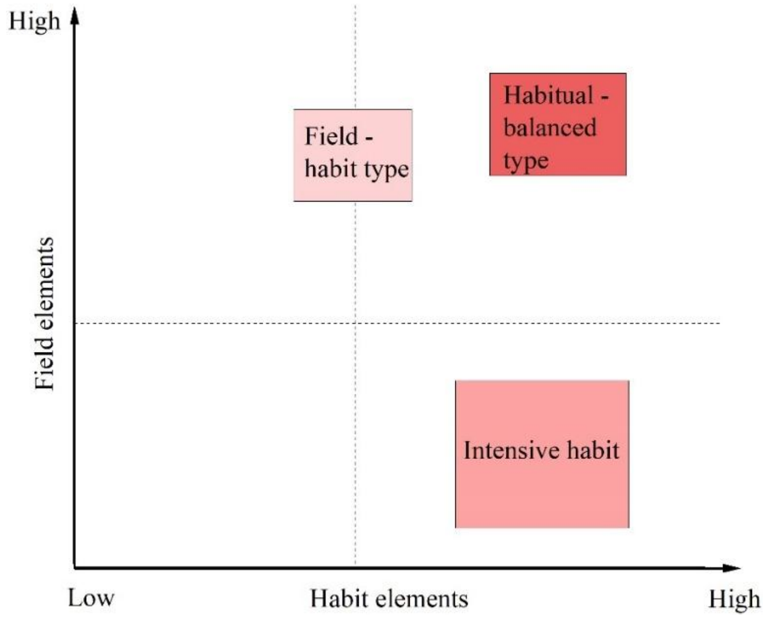

Figure 2: The type of person training the level of the path type

4 Conclusion

This research aims to develop practical skills in the corn production industrial cluster in the new era. Based on the analysis of correlations between the factors that impact, the roles played by such factors are analyzed, and paths to developing practical skills in the corn production industrial cluster are proposed. The findings have been obtained through a study of necessary conditions and the use of the fsQCA approach.

In terms of the influencing factors used by the corn industry cluster in the new era, those that have the most important effects are government-related, industry-related, academic, and research-based competencies because they play the first positions in the ranking in terms of their importance in influence, causation, and total impact. After these, cooperation and exchange rank second, showing their significance in influence, centrality, and causation. Quality evaluation comes third, proving its relevance in influence, impact, and centrality indicators. Capital support holds a relatively less central position but shows its relevance in centrality and susceptibility to influence. With regard to their interactions, the cultivation of practical talents in the corn industry cluster must take into account the needs of the government and industries in higher education and research; pay attention to the quality evaluation of student training; encourage learning cooperation and exchange among universities and students; and create an encouraging atmosphere of capital support for businesses.

The analysis focuses on how eight variables—the government, industry, academic institutions and research, curriculum system, and others—affect the development of applied talents within the corn industry cluster in the modern age. Using Necessary Condition Analysis (NCA) and Fuzzy Set Qualitative Comparative Analysis (fsQCA), the study examines the necessity of each conditional variable with respect to the outcome variable, as well as the effects of the eight variables on the joint state to determine the effective channels for developing applied talents in the corn industry clusters in the new age. This results in the derivation of four talent-development channels, which fall into three types: strong habitual, field-habitual, and habitual-equilibrium channels. The typology provides actionable insights into the practice of applied talent development in different industry clusters in today’s age. It is clear that there is no one necessary condition among the eight variables in creating the outcome variable, indicating the complicated nature of the process of applied talent development in the corn industry cluster in the new age.

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