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Exploring the Impact of Influencing Factors on High-Quality Development in the Manufacturing Industry: A Comprehensive Analysis using Citespace Visualization and WSR-DEMATEL



Abstract: - High-quality development of the manufacturing industry is a key path to meet the growing needs of the people for a better life and boost China's economy under the double-cycle development pattern. The study focuses on the influencing factors of the high-quality development level of the manufacturing industry. Firstly, the study utilizes the Citespace visualization analysis tool to outline the research hotspots and development trends in this field, comprehensively understanding the interrelationships among influencing factors and their evolving tendencies. This provides valuable information resources for constructing the final indicator system of influencing factors; Secondly, the study constructed an index system of influencing factors based on the WSR (wuli-shili-renli) system methodology, and at the same time, it used the decision-making experiment and experimentation method (DEMATEL) to explore the interrelationships among the 11 influences and to calculate their centrality and causality; Finally, this study portrayed and comparatively analyzed the degree of importance of each influencing factor, and identifies the key influencing factors. The result shows that: Executive team heterogeneity, human capital structure, government subsidy, digital economy, business environment, and green technology innovation are the key influencing factors for the high-quality development of the manufacturing industry. The study can provide theoretical significance and practical enlightenment for the manufacturing industry to enhance its development level to realize high-quality development.

Keywords: quality-development, influencing factors, manufacturing industry, Citespace Visualization, WSR-DEMATEL

I. INTRODUCTION

"High-quality development of the economy" has become an important issue in the new era of development. As a basic industry of the national economy, the manufacturing industry plays the role of a mainstay in the process of realizing a new leap in China's economic strength. Although China is the world's largest manufacturing country, there is still a big gap between becoming a manufacturing powerhouse, and problems such as insufficient innovation capacity, overcapacity, and serious pollution are becoming more and more prominent. At the same time, the international situation has changed, with countries such as the US and Germany stimulating economic growth through "re-industrialization", India, as well as Southeast Asian countries, use their cost advantages to attract manufacturing links to move, China's demographic dividend is gradually disappearing. Therefore, promoting the high-quality development of the manufacturing industry is the primary task and goal of realizing high-quality economic development.

In order to promote high-quality development of the manufacturing industry and achieve the goal of high-quality economic development. Scholars have conducted in-depth discussions in the field of high-quality development, searched for factors and paths to promote high-quality development of the manufacturing industry based on different perspectives. Although some achievements have been made, there are still areas that need improvement: On the one hand, much of the previous research focuses on the optimization effect of a certain factor on the system, with little attention paid to the logical relationship and correlation between the influencing factors; On the other hand, some studies have failed to construct a system of influencing factors based on the whole situation, and the scope of key factor identification is not comprehensive enough. To synthesize the above, the study applied the visualization tool Citespace in the field of computer science to explore high-quality research hotspots in the development of manufacturing industry. Furthermore, the WSR system is used for optimization and the construction of an influential factor system for high-quality development in the manufacturing industry.

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And at the same time used the DEMATEL method based on triangular fuzzy number to identify the key influencing factors, which will provide a theoretical basis for upgrading the level of manufacturing development and realizing a new leap in the economy.

II. MANUFACTURING INDUSTRY HIGH-QUALITY DEVELOPMENT INFLUENCING FACTOR SYSTEM CONSTRUCTION BASED ON CITESPACE AND WSR

The research team employed the Citespace visualization analysis tool to delve into the intricate network of influencing factors shaping the high-quality development of the manufacturing industry. Through the use of Citespace, researchers were able to visually map out the intricate connections and evolution of key factors impacting the industry's development trajectory. This visualization not only offered a more intuitive grasp of the complex relationships between various factors but also facilitated the identification of crucial pathways for fostering high-quality development within the manufacturing sector.

Based on the co-occurrence network of keywords, a more in-depth clustering analysis of the keywords in the literature is conducted, and a timeline visualization is performed to present the time span of each cluster and the relationships between different clusters, so as to clearly demonstrate the evolution process of high-quality development research. Generally, a clustering module value $Q > 0.3$ indicates a significant clustering structure, while an average silhouette value $S > 0.7$ indicates convincing clustering. The keyword timeline of the literature from the WOS is shown in Figure 1, where $Q = 0.4472$ and $S = 0.7704$, meeting the criteria. From Figure 1, it can be observed that high-quality development has been a research hotspot since its proposal. Environmental regulation, digital economy, total factor productivity, big data, digital transformation, and artificial intelligence are also current research trends. This provides a more scientific basis for the construction of an index system for influencing factors of high-quality development in the manufacturing industry using the WSR methodology.

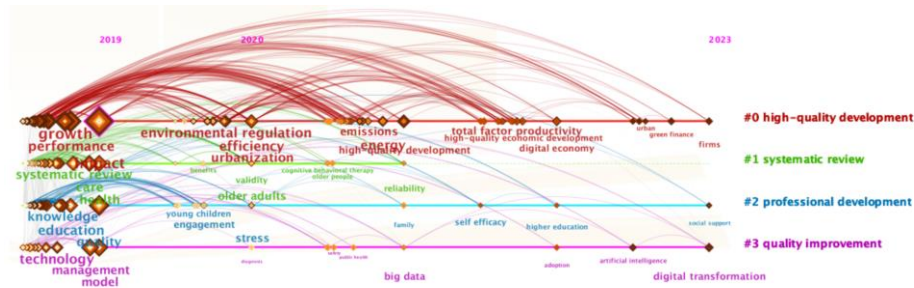


Figure 1: Timeline mapping of keywords in WOS-sourced references

WSR methodology is a systematic methodology for solving complex problems that take into account both qualitative and quantitative analysis, which was proposed by Chinese experts in the United Kingdom in 1994 [1, 2]. The methodology is applied in the fields of emergency management, tourism management, and product quality management, and demonstrates the traditional Chinese discursive thinking of turning complexity into simplicity and mastering complexity with simplicity, the ability to move away from a single perspective to a multi-perspective attributional analysis of the problem. The manufacturing industry's high-quality development environment is compounded by multiple parties, not only the internal enterprise but also the external enterprise and the market competition environment, which also determines the manufacturing high-quality development of this issue has a high degree of complexity and systematic, only emphasize a certain party or from a certain perspective is difficult to be solved. Therefore, the study uses the WSR methodology to explore the influencing factors of high-quality development in the manufacturing industry.

A. Wuli Dimension

"Wuli" means the mechanism of the movement of matter, which is a visualization of objective facts. Wuli factors are objective factors in the process of high-quality development in manufacturing. The study looks at four aspects of environmental regulation, enterprise investment innovation, government subsidies, and the digital economy.

Environmental regulation is the environmental standards set by the government, mainly through intervening in the economic activities of enterprises to achieve the purpose of solving or reducing environmental pollution [3]. Whether it emphasizes direct intervention in the production process of enterprises through mandatory administrative rules and regulations to regulate the behavior of enterprises; or whether it is the Government's use of the price mechanism to regulate enterprises and guide them to choose or upgrade pollution control technologies

and adjust their behavior independently. Regardless of the means, these environmental regulations can contribute directly to industrial development or indirectly to industrialization by influencing the allocation of resources to enterprises and enhancing the level of technological innovation [4].

Innovation is the source of power for enterprises to realize sustainable development and is the key for enterprises to survive and not be eliminated by the times [5]. The material foundation determines the superstructure, and the enhancement of innovation ability cannot be separated from the support of enterprise innovation investment. Higher levels of enterprise innovation investment can contribute significantly to enterprise growth, especially for manufacturing. Enterprise innovation investment can effectively enhance manufacturing development by promoting technological innovation and upgrading [6].

Investing in the manufacturing industry for R&D upgrading and technological innovation is a high-risk investment project, which cannot support its enterprises to carry out innovative activities without strong financial strength. Government subsidies are an important way for enterprises to finance themselves, both directly by increasing their resource pool and indirectly by influencing their investment in innovation, thus expanding their resource pool and reserving enough resources for them [7].

The digital economy is the sum of economic development activities driven by the use of modern communication technology and big data, and is a new engine to promote the high-quality development of the manufacturing industry [8]. The digital economy promotes technological innovation and transformation and upgrading of the manufacturing industry through digital infrastructure construction, popularization of digital applications and upgrading of digital industrial institutions. Mastering the law of spatial and temporal evolution of the digital economy to realize factor valorization is an important booster to promote the high-quality development of the manufacturing industry [9, 10].

B. Shili Dimension

"Shili" refers to the reason for doing things and is the theoretical basis for understanding the world and transforming it. Shili influencing factors include innovation infrastructure synergy, corporate social responsibility, business environment, and green technology innovation.

Innovation infrastructure synergy is the deep integration and integrated development of scientific research, achievement transformation, talent training, and industrial development [11]. Isolated innovation infrastructures can hardly guarantee the maximization of the value of internal elements, and only efficient synergies between innovation infrastructures can give rise to multifactor coupling effects (especially between industry and science). Therefore, innovation infrastructure synergies can realize the goal of promoting high-quality manufacturing development through multiple channels through knowledge transfer, outcome transformation and technology integration.

As micro subjects of economic activities, enterprises cannot develop independently from other related parties. The existing literature has shown that the fulfillment of corporate social responsibility(CSR) can attract more powerful partners and investors based on shaping its brand image and continuously expanding its own resource pool [12]. The fulfillment of CSR can enhance the trust between enterprises, and is conducive to promoting the synergistic development of enterprises themselves and related parties [13]. To sum up, the fulfillment of social responsibility by enterprises is an important measure to realize value co-creation and promote economic development.

Business environment refers to the sum of relevant external factors and conditions in the process of enterprise growth, involving but not limited to the external environment of government affairs, humanities, and level of openness, which is a composite ecosystem [14]. A high-quality business environment can promote the efficiency of corporate innovation and the green economy; It can attract the inflow of talent and foreign investment, and stimulate corporate vitality through market regulation; Laws and regulations such as intellectual property protection also create a rigid protective shell for enterprises, which can effectively drive their innovation activities [15]. The business environment can further strengthen the "wuli" and "shili" foundations of the development process to accelerate the realization of the Goals.

Environmental pollution is a growing problem, resources are becoming scarce. Green development is a key part of the high-quality development. Green technology innovation can help the manufacturing industry to realize innovation-driven development, reduce the generation of pollutants on the basis of realizing the growth of innovation capacity, and realize the bilateral development of the economy and the environment [16]. Green technology innovation capability is the key to shorten the gap between Chinese manufacturing enterprises and

overseas high-tech enterprises, and is an important driving force for realizing a high-level leap in China's manufacturing industry [17].

C. Renli Dimension

“Renli” means the reason to be human, people are the main actors of activities, and the "shili" and "wuli" in the actual work need people to coordinate and judge, so the "renli" is a crucial part of the system methodology. “Renli” refers to the human factor, focusing on people, groups, and the relationships between them. Therefore, the “renli” in the influencing factor system constructed in this study are executive team heterogeneity, human capital structure, and entrepreneurial social capital.

In practice, the executive management team is the operator of the enterprise's operation process and is the core decision maker of the enterprise to carry out top-level design and decide the development direction. According to senior echelon theory, top executive heterogeneity refers to differences in executives' demographic characteristics, values, functioning, and cognition [18]. Studies have shown that these differences make it possible to obtain diversified information and knowledge from multiple channels, and to analyze and reflect on the data and information obtained from different perspectives based on taking into account the systemic and complex characteristics of the issue of high-quality development of the manufacturing industry, to formulate decisions and programs conducive to the high-quality development of the enterprise [19].

The level of human capital structure is not only a key factor in driving economic growth but also an important enabler in realizing the primary mission of the manufacturing industry. A high level of human capital structure can realize the high-quality development of the manufacturing industry by penhancing technological innovation and improving the level of industrial agglomeration through multiple paths [20]. In the face of a complex and changing market environment, the level of human capital structure is an indispensable and important supporting force for China's upgrading to become a manufacturing powerhouse [21].

Entrepreneurial social capital is the set of social networks that individual entrepreneurs possess for resource acquisition and empowerment functions, mobilizing internal and external stakeholders to interact with resources in their social networks [22]. Based on resource-based theory, entrepreneurs can make use of multiple social relationships in their social networks to promote the rational distribution of knowledge, labor, and other factors of production and make the right decisions, to achieve the upgrading and transformation through the more efficient use of social resources [23].

Taken together, the final system of influencing factors is shown in Table 1.

Table 1: Index system for influencing factors

Serial number	Criterion layer	Indicator layer
Q1	Renli	executive team heterogeneity
Q 2		human capital structure
Q 3		entrepreneurial social capital
Q 4	Wuli	environmental regulation
Q 5		enterprise investment innovation
Q 6		government subsidies
Q 7		digital economy
Q 8	Shili	innovation infrastructure synergy
Q 9		corporate social responsibility
Q 10		business environment
Q 11		green technology innovation

III. MODEL FOR IDENTIFYING FACTORS INFLUENCING HIGH-QUALITY DEVELOPMENT OF MANUFACTURING INDUSTRY BASED ON DEMATEL

The decision making test and experimentation method (DEMATEL) is a systematic analysis method that takes into account the logical relationships between factors. The key influencing factors were identified from the complex system of indicators by calculating the values of four indicators: Influence, influenced, centrality, and cause of each factor, and by constructing a causal diagram. Manufacturing high-quality development of complex influencing factors, through this method can be an in-depth study of manufacturing high-quality development of key influencing factors, for decision makers to make decisions to provide a scientific basis, help manufacturing high-quality development. Jin [24], Zhao [25], and Hu [26] elaborated and validated the relevant principles, steps, and processes of the fuzzy trigonometric function-based DEMATEL method with the following modeling process:

A. Construction of influencing factor system

Firstly, the study used citespace to summarize the influencing factors of high-quality development of the manufacturing industry mentioned in the relevant literature to form a collection of alternative factors [27]; Secondly, the study employed interviews to solicit the opinions and suggestions of experts in the relevant fields; Finally, the formalized system of indicators of impact factors was developed (as shown in table2).

Table 2: Base language set AL1

Linguistic operators	Triangular fuzzy values
Not have(N)	(0,0,0.25)
Weaker(VL)	(0,0.25,0.5)
Low(L)	(0.25,0.5,0.75)
High(H)	(0.5,0.75,1.00)
Very high(VH)	(0.5,1.00,1.00)

B. Construction of evaluation scale sets

Construct the base language set and supplementary language set based on triangular fuzzy numbers according to the contents in Table 2 and Table 3.

Table 3: Supplementary language set

Linguistic operators	Triangular fuzzy values
Not have +(N+)	((0, 0),0.125,(0.25,0.5))
Weaker +(VL+)	((0,0.25),0.25, (0.5,0.75))
Low +(L+)	((0.25,0.5),0.5, (0.75,1.00))
High +(H+)	((0.5,0.75),0.75, (1,1))

C. Construction of hybrid initial direct correlation matrix

Invite 15 professors in related fields and senior industry insiders to score the degree of importance between the 11 influencing factors, and complete the construction of the initial direct correlation matrix, which is recorded as $C_{aij}^{\%} = [C_{ij}]_{n \times n}$, indicates the group's ratings for factor i and factor j .

$$C_k^{\%} = \begin{cases} B_k^{\%}, C_k^{\%} \in Q1 \\ A_k^{\%}, C_k^{\%} \in Q2 \end{cases} \quad (1)$$

D. Transformations of direct correlation matrices of interval numbers

From equation 2 to equation 7, the interval number direct correlation matrix is constructed. In this case, the upper and lower bound formulas for the number of intervals for calculating the triangular fuzzy number are:

$$B_{\alpha k ij}^{-} = \frac{(b_{l k ij} + b_{m k ij})}{2} \quad (2)$$

$$B_{\alpha k ij}^{+} = \frac{(b_{l k ij} + b_{u k ij})}{2} \quad (3)$$

The complementary language set is transformed and the upper and lower bounds of the fuzzy number of triangular intervals are computed as:

$$A_{\alpha k ij}^{-} = \int_0^1 \alpha(a_{l k ij} - (a_{m k ij} - a_{l k ij})\alpha) d\alpha + \int_0^1 \beta(a_{l k' ij} - (a_{m k ij} - a_{l k' ij})\beta) d\beta = (a_{u k ij} + 4a_{m k ij} + a_{u k' ij})/6 \quad (4)$$

$$A_{\alpha k ij}^{+} = \int_0^1 \alpha(a_{u k ij} - (a_{m k ij} - a_{u k ij})\alpha) d\alpha + \int_0^1 \beta(a_{u k' ij} + (a_{m k ij} - a_{u k' ij})\beta) d\beta = (a_{u k ij} + 4a_{m k ij} + a_{u k' ij})/6 \quad (5)$$

The base language set is integrated with the complementary languages and the transformed intervals and converted into the interval matrix $C_{\alpha k}^{\%} = [C_{\alpha k ij}^{-}, C_{\alpha k ij}^{+}]$, with the following formula:

$$C_{\alpha k ij}^{-} = \begin{cases} B_{\alpha k ij}^{-}, C_{\alpha k ij}^{-} \in AL1 \\ A_{\alpha k ij}^{-}, C_{\alpha k ij}^{-} \in AL2 \end{cases} \quad (6)$$

$$C_{\alpha k ij}^{+} = \begin{cases} B_{\alpha k ij}^{+}, C_{\alpha k ij}^{+} \in AL1 \\ A_{\alpha k ij}^{+}, C_{\alpha k ij}^{+} \in AL2 \end{cases} \quad (7)$$

E. Calculation of upper and lower bound specification direct correlation matrix and influence relationship matrix

From equation 8 and equation 9, the upper and lower bound specification direct correlation matrices are obtained as follows:

$$g_{ij}^{-} = \frac{m_{ij}^{-}}{\max_{1 \leq i \leq n} \sum_{l=1}^n m_{il}^{-}} \quad (8)$$

$$g_{ij}^+ = \frac{m_{ij}^+}{\max_{1 \leq i \leq n} \sum_{j=1}^n m_{ij}^+} \tag{9}$$

From equation 10, the upper and lower bounds influence relationship matrix is obtained $T^\pm = [t_{ij}^\pm]_{n \times n}$.

$$T^\pm = G^\pm(E - G^\pm)^{-1} \tag{10}$$

Where E is the unit matrix.

F. Calculation of horizontal and vertical sums

From equation 11 and equation 12 the upper bound influence relationship matrix and the lower bound influence relationship matrix, the horizontal and vertical sums are calculated.

$$R^{%} = [R_i^-, R_i^+] = [\sum_{j=1}^n t_{ij}^-, \sum_{j=1}^n t_{ij}^+] \tag{11}$$

$$D^{%} = [D_i^-, D_i^+] = [\sum_{i=1}^n t_{ij}^-, \sum_{i=1}^n t_{ij}^+] \tag{12}$$

G. Calculation of influence, influenced, centrality and causality

The formula for the degree of influence is equation 13 and the formula for the degree of influenced is equation 14.

$$R_{ij} = \frac{\max[0, l(H_i) - l(H_j) - \max(0, R_j^U - R_j^L)]}{l(H_i) + l(H_j)} \tag{13}$$

Among them, $l(H_i) = R_i^+ - R_i^-$, $l(H_j) = R_j^+ - R_j^-$

$$D_{ij} = \frac{\max[0, l(H_i) - l(H_j) - \max(0, D_j^U - D_j^L)]}{l(H_i) + l(H_j)} \tag{14}$$

Among them, $l(H_i) = D_i^+ - D_i^-$, $l(H_j) = R_j^+ - R_j^-$

The formula for calculating the degree of centrality is equation 15 and the formula for calculating the degree of cause is equation 16.

$$P_i = R_i + D_i \tag{15}$$

$$Y_i = R_i - D_i \tag{16}$$

H. Drawing and analyzing

Drawing the factor influence relationship diagram, combining the degree of influence, influenced, center and cause to determine the key influencing factors.

IV. CASE STUDY

The study uses the expert interview method, invites 15 professors in related fields and senior industry insiders to score the logical relationship and degree of importance between the 11 influencing factors. The results were homogenized and centered to eliminate extreme values and achieve the brainstorming effect, and the final hybrid initial direct correlation matrix was constructed as shown in table 4.

Table 4: Hybrid initial direct correlation matrix for high-quality development of manufacturing

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Q1	N	VL	L+	VL	H	VL	L	L+	L+	VL	L+
Q2	VH	N	H+	VL	L	L	VH	VH	H	H	VH
Q3	H	H	N	H	VH	VL+	VH	H+	H	H	H
Q4	VL	L	VH	N	VH	H+	H+	H	VH	H+	H
Q5	H	L	H	VH	N	L+	H	H+	H	H	VH
Q6	VL	L	L+	H	L	N	H	L	L	H	H
Q7	L	VL	H	L	H	L+	N	H	L	VH	H+
Q8	L+	H	VH	H	H	L	VH	N	L	H	VH
Q9	L+	H	H+	H	VH	VL	H	H+	N	VH	VH
Q10	VL	L+	H	L+	L	L	H	VH	H	N	H
Q11	VL	L+	L	H	H+	H	H	L	H	H	N

The interval number correlation matrix is calculated according to equation 1 to equation 7 and the results are shown in table 5 and table 6:

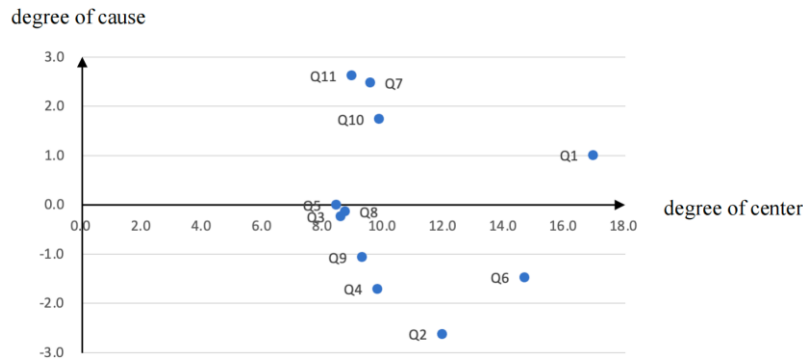


Figure 2: Influence factor relationship diagram

Table 5: Interval number correlation matrix1

	Q1	Q2	Q3	Q4	Q5	Q6
Q1	[0,0.125]	[0.125,0.375]	[0.458,0.625]	[0.125,0.375]	[0.625,0.875]	[0.125,0.375]
Q2	[0.875,1]	[0,0.125]	[0.708,0.833]	[0.125,0.375]	[0.375,0.625]	[0.375,0.625]
Q3	[0.625,0.875]	[0.625,0.875]	[0,0.125]	[0.625,0.875]	[0.875,1]	[0.208,0.375]
Q4	[0.125,0.375]	[0.375,0.625]	[0.875,1]	[0,0.125]	[0.875,1]	[0.708,0.833]
Q5	[0.625,0.875]	[0.375,0.625]	[0.625,0.875]	[0.875,1]	[0,0.125]	[0.458,0.625]
Q6	[0.125,0.375]	[0.375,0.625]	[0.458,0.625]	[0.625,0.875]	[0.375,0.625]	[0,0.125]
Q7	[0.375,0.625]	[0.125,0.375]	[0.625,0.875]	[0.375,0.625]	[0.625,0.875]	[0.458,0.625]
Q8	[0.458,0.625]	[0.625,0.875]	[0.875,1]	[0.625,0.875]	[0.625,0.875]	[0.375,0.625]
Q9	[0.458,0.625]	[0.625,0.875]	[0.708,0.833]	[0.625,0.875]	[0.875,1]	[0.125,0.375]
Q10	[0.125,0.375]	[0.458,0.625]	[0.625,0.875]	[0.458,0.625]	[0.375,0.625]	[0.375,0.625]
Q11	[0.125,0.375]	[0.458,0.625]	[0.375,0.625]	[0.625,0.875]	[0.708,0.833]	[0.625,0.875]

Table 6: Interval number correlation matrix2

	Q7	Q8	Q9	Q10	Q11
Q1	[0.375,0.625]	[0.458,0.625]	[0.458,0.625]	[0.125,0.375]	[0.458,0.625]
Q2	[0.875,1]	[0.875,1]	[0.625,0.875]	[0.625,0.875]	[0.875,1]
Q3	[0.875,1]	[0.708,0.833]	[0.625,0.875]	[0.625,0.875]	[0.625,0.875]
Q4	[0.708,0.833]	[0.625,0.875]	[0.875,1]	[0.708,0.833]	[0.625,0.875]
Q5	[0.625,0.875]	[0.708,0.833]	[0.625,0.875]	[0.625,0.875]	[0.875,1]
Q6	[0.625,0.875]	[0.375,0.625]	[0.375,0.625]	[0.625,0.875]	[0.625,0.875]
Q7	[0,0.125]	[0.625,0.875]	[0.375,0.625]	[0.875,1]	[0.708,0.833]
Q8	[0.875,1]	[0,0.125]	[0.375,0.625]	[0.625,0.875]	[0.875,1]
Q9	[0.625,0.875]	[0.708,0.833]	[0,0.125]	[0.875,1]	[0.875,1]
Q10	[0.625,0.875]	[0.875,1]	[0.625,0.875]	[0,0.125]	[0.625,0.875]
Q11	[0.625,0.875]	[0.375,0.625]	[0.625,0.875]	[0.625,0.875]	[0,0.125]

According to equation 8 to equation 16, calculate the influence(R), influenced(D), cause(P), and center(Y) degrees for each influencing factor. The results are shown in table 7.

Table 7: Summary of the results

Influencing Factors	Influence Degree(R)	Influenced Degree(D)	Center Degree(P)	Cause Degree(Y)
Q1 Executive team heterogeneity	8.974	7.960	16.934	1.014
Q2 Human capital structure	4.654	7.270	11.925	-2.616
Q3 Entrepreneurial social capital.	4.159	4.389	8.548	-0.231
Q4 Environmental regulation	4.040	5.740	9.780	-1.700
Q5 Enterprise investment innovation	4.211	4.207	8.418	0.003
Q6 Government subsidies	6.591	8.058	14.649	-1.467
Q7 The digital economy	6.008	3.526	9.534	2.482
Q8 Innovation infrastructure synergy	4.283	4.415	8.698	-0.132
Q9 Corporate social responsibility	4.105	5.166	9.272	-1.061
Q10 Business environment	5.788	4.046	9.834	1.742
Q11 Green technology innovation	5.775	3.150	8.925	2.625

Based on the degree of cause and centrality, a causality diagram between the influencing factors is determined, as shown in figure 2.

Sorting the cause degree, the results are as follows: $Q11 > Q7 > Q10 > Q1 > Q5 > Q8 > Q3 > Q9 > Q6 > Q4 > Q2$. According to the analysis of table 7 and figure 2, the cause degree of Q2, Q6, Q3, Q4, and Q8 is less than 0, which belongs to the result attribute, while the cause degree of Q5, Q11, Q7, Q1, and Q10 is greater than 0 which belongs to the cause attribute. Cause degree is calculated by subtracting the value of Influenced from the value of Influencing and reflects the causal relationship between the influencing factors.

Firstly, the Q1 cause degree score is 1.014 for the cause attribute, ranked fourth, in the upper-middle position; Secondly, the factor's centrality score is ranked first, which is of high importance and should be focused on by decision-makers; Finally, the factor's influence degree is ranked first, and the influenced degree score is ranked second, which is more supportive of the factor's high degree of influence on other factors. Taken together, Q1 executive team heterogeneity is categorized as a key influence factor.

The centrality of the Q2 human capital structure is less than 0, but it has a high centrality score and is ranked third, indicating that the importance of this factor is high. At the same time, this factor has a medium level of influence, a high score of being influenced, and is not easily disturbed by other factors when influencing them. Therefore, Q2 human capital structure is classified as a key influencing factor. Q6 situation is like it, therefore, Q6 is also a key influencing factor.

Q4 is ranked second to last in terms of cause and first to last in terms of influence, indicating that the influence of this factor on other factors is not significant; At the same time, the centrality of this factor is ranked fifth, which is located at a medium level, but its influence score is ranked fourth, that the factor is moderately associated with other factors, and it can't play a significant role in promoting the optimization of the system as a whole. Taken together, Q4 environmental regulation is not a key influence factor, and F3, F8, and F9 are similar to it, so they are also not key influence factors.

Although Q5 has a cause degree greater than 0 as a cause attribute, the low centrality score indicates that it is of average importance; meanwhile, the factor's rankings of influence and influenced are both eighth, indicating that the factor is more influenced by other factors. Combined with the factor's cause degree score of 0.003, the score is slightly greater than 0. Therefore, Q5 is not a key influencing factor.

Q7 has a cause degree greater than 0, which is a result attribute and ranks among the top 3. The center degree score is 9.534, ranking sixth, but the gap between the fourth and fifth places is very small, indicating that this factor also has high importance; at the same time, observing the degree of influence and the degree of being influenced, the degree of influence ranked third and the degree of being influenced ranked second to the last, indicating that this factor influences the rest of the factors at the same time as the other factors have a relatively close connection with the key factors. Therefore, Q7 is categorized as a key influencing factor, and Q10 is also categorized as a key influencing factor, as it is similar to Q10.

Q11's cause degree score ranks first, and the influence degree is in the upper middle level, indicating that it is its wider influence on the remaining factors. At the same time, the center degree score of Q11 scores more general, according to the influence degree and the influenced degree score can be seen, green technology innovation is very strongly linked to influencing other factors. Therefore, it is included in the key factors.

Taken together, the key influencing factors are Q1(executive team heterogeneity), Q2(human capital structure), Q6 (government subsidies), Q7(digital economy), Q10 (business environment), and Q11 (green technology innovation).

V. CONCLUSION

Based on the Citespace visualization analysis tool and the WSR system methodology, this study analyzes the influencing factors of high-quality development of the manufacturing industry from the perspectives of wuli, shili, and renli, and identifies 11 influencing factors such as executive team heterogeneity, human capital structure, enterprise innovation investment, digital economy, green technology innovation, and so on. On this basis, the expert group was invited to judge the logical relationship and the degree of importance between the 11 influencing factors and to construct the initial evaluation matrix by using the fuzzy number of triangular intervals to represent them in a more refined way. Through the DEMATEL to calculate the cause degree and other indicators of each influencing factor and to portray the importance degree of each factor and comparative analysis, and finally screened out 6 key influencing factors (executive team heterogeneity, human capital structure, government subsidies, digital economy, business environment, and green technology innovation) for high-quality development of the manufacturing industry. The key influencing factors of high-quality development of the manufacturing industry identified based on the WSR-DEMATEL framework can provide a theoretical basis and practical

inspiration for the government to carry out macro-control and the transformation and upgrading of the manufacturing industry to realize high-quality development.

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