Research on the identification and prevention of supply chain finance risks based on DEMATEL-ISM model

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Abstract. This paper subdivides supply chain finance risks according to the market players involved in supply chain finance, uses DEMATEL to classify the status of different risk factors and quantify the degree of influence, and then applies ISM to construct a supply chain finance risk identification system. The study found that the lack of application of new technologies and the poor cooperation among the various actors in the supply chain are the most important factors in supply chain finance risks, and the information flow risk is the main factor that causes many supply chain finance risks. The study found that the lack of application of new technologies and the lack of cooperation among supply chain actors are the most important risks in supply chain finance, and information flow risks are the main factors that cause many supply chain financial risks.

Keywords: supply chain finance; risk identification; DEMATEL; ISM.

1. Introduction

In the year 2020, the world economy has been under downward pressure due to the impact of the new crown epidemic. The difficulty and high cost of financing for SMEs is becoming more and more serious. The downturn of SMEs will seriously hinder the recovery and development of the social economy. Supply chain finance, as an effective way to revitalise the enthusiasm of SMEs and solve their financing problems, has received attention from all sectors of society. By integrating logistics, commercial flow, information flow and capital flow, supply chain finance provides inclusive and flexible financial services for each link of the supply chain, maximising the operational efficiency and minimising the risk of the whole supply chain. However, due to the large number of participants involved and the complexity of the process and chain network, supply chain finance risks have become a huge obstacle to the universalisation of supply chain finance, and the identification of risks is of paramount importance.

Risk identification is a systematic scientific approach or experience to analyse and classify the causes of risk before it arises, so that we can plan ahead. For example, Liu and Tian [1] conducted a literature review on the evolution of the connotation and risk management of supply chain finance in the past decade, and classified financial risks into overall supply chain risks, supply chain finance-specific risks and other risks, following the usual model of research. Starting from the supply chain finance dominated by the core enterprises, Fu [2] divides the risks of the supply chain finance into different risks under the mode of order financing, accounts payable, inventory pledge and prepayment according to the operation mode, and uses the logistic model to conclude that the core enterprise stability is an important factor affecting the supply chain finance. Qin[3] divided the risks of supply chain finance into the risks of supply chain finance of enterprise operation, the risks of supply chain finance of bank development, and the risks of imperfect credit mechanism and legal system according to the subjects involved. Li and Nie[4], based on the root theory, divided the inducing factors of supply chain finance risk into environmental factors, network factors and management factors, and established a model of the inducing factors of supply chain finance risk based on the three factors. Lu[5] uses the supply chain economy as the background and classifies the risks of supply chain

finance from the perspective of the role of the supply chain finance system on the supply chain economy into unbalanced development of the system, low enthusiasm of core enterprises, risk of leakage, backward application of technology and high potential risks.

Most of the existing studies focus on the identification of supply chain financial risks according to risk categories, although this method is more operable, the classification method is more general and has limited reference value. The importance of identifying similar risks in different links of the supply chain has different effects on the main body of the link in which it is located, and the reference value for the main body of different links is also different. The application of new technologies has led to a qualitative change in the content of the original risk identification. Therefore, this paper classifies different risk factors according to the main market players identified by the commonly operating supply chain finance model, uses the Delphi method to score the different factors, and then uses the DEMATEL method (decision experiment and evaluation test method) to quantify the interrelationship and importance of different risk factors, and uses the ISM method to a hierarchical model of supply chain finance risk is constructed to provide an effective reference for the prevention of supply chain finance risk for the participants of different links.

2. Construction of supply chain finance risk indicator system

There is a clear division of functions among the various market players involved in supply chain finance, and supply chain finance also has the characteristics of a supply chain system. In the course of decades of development, supply chain finance has formed a chain structure. As the functions undertaken by different subjects are different and the risks they face are also very different. The supply chain finance link chart is shown in Figure 1 below.

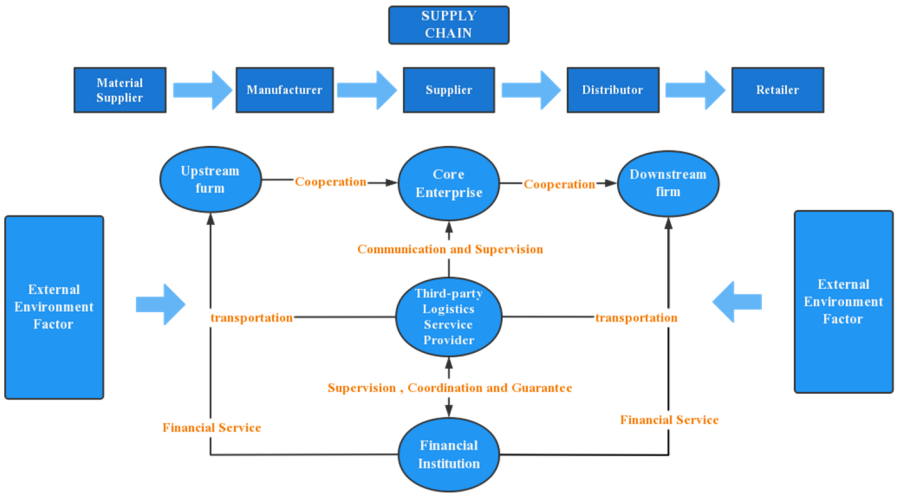

Figure 1 Supply chain finance flow chart

2.1 2.1 Financial institution risk indicator system

Related to the classification in academic journals and dissertations since 2016, the adverse risk factors faced by financial institutions are mainly classified as: staff and institutional misconduct (S1), internal management system irregularities (S2he function of financial institutions in the supply chain financial system is mainly undertaken by commercial banks. For the identification of risk factors of commercial banks in the supply chain system, this paper selects the types of loss incidents of commercial banks r), inadequate information access and transmission bias (S3), unreasonable credit granting mechanism (S4), vicious competition among financial institutions (S5), inadequate application of information technology (S6), mismatch between services and demand (S7), and improper handling of accounting accounts (S8), among other risks.

2.2 Core enterprise risk indicator system

For the core enterprises in the supply chain strip, this paper classifies the risk factors into the following risks: fluctuations in the industry status of the core enterprises (S9), misconduct of enterprise staff (S10), irregularities in enterprise management and operation (S11), distortion in information disclosure and transmission (S12), unfavourable cooperation with upstream and downstream supply chain entities (S13), and the existence of moral hazard issues (S14). The risks in this segment mainly affect the upstream and downstream communication ability and overall operation of supply chain finance.

2.3 Upstream and downstream SME risk indicator system

As the main service targets of supply chain finance, the risk characteristics of upstream and downstream SMEs are significantly different from those of other entities. The risk indicators of upstream and downstream SMEs are mainly divided into the following risks: distortion of information disclosure and transmission by SMEs (S15), unfavourable business operation by SMEs themselves (S16), unfavourable cooperation with other actors in the supply chain (S17), careless choice of security in rem (S18) and misallocation of personnel and information (S19). The risks in this segment mainly affect the implementation of supply chain finance services and the communication between the various links of the supply chain.

2.4 Third-party logistics enterprise risk indicator system

Third-party logistics companies play a role in providing transportation and storage services, communicating and coordinating the entire supply chain and supervising the various segments on behalf of financial institutions. The indicators of this link are divided into the following risks: misconduct of third-party staff (S20), unfavourable third-party information transmission (S21), high third-party operational risks (S22), inadequate third-party supervision and coordination functions (S23) and insufficient third-party risk control capabilities (S24), which mainly affect the coordination ability of supply chain finance and the supervision ability of financial services.

2.5 External environmental risk indicator system

The external environment risk indicator mainly categorises exogenous factors excluding the four market participants. This paper mainly classifies them into risks such as adverse fluctuations in the economic environment (S25), insufficient national policy guidance (S26), low level of application of emerging technologies (S27), insufficient stability of the industry supply chain (S28) and instability of unexpected factors (S29). This link mainly affects the environment in which supply chain finance is located and the stability of the whole chain. In summary, the indicator system constructed in this paper is shown in Table 1.

Table 1 Classification of supply chain finance risk indicators

Tier 1 Indicator Classification	Secondary indicator classification	Source documents
Financial institutions	Staff and Institutional Misconduct (S1)	Xia & Zhang (2020)[6]
	Internal management system not standardised (S2)	
	Inadequate access to information and transmission bias (S3)	
	Unreasonable credit facilities (S4)	
	Unhealthy competition among financial institutions (S5)	
	Inadequate application of information technology (S6)	
	Mismatch between services and demand (S7)	

	Mishandling of accounting accounts (S8)	
Core Enterprises	Fluctuations in the industry position of core companies (S9)	Huang & Lian (2016)[7]
	Corporate staff misconduct (S10)	
	Irregularities in business management and operation (S11)	
	Disclosure of information and transmission distortion (S12)	
	Weak cooperation with upstream and downstream supply chain players (S13)	
	There are moral hazard issues (S14)	
Upstream and downstream SMEs	SME Disclosure and Transmission Distortion (S15)	Zheng & Zhang (2020)[8]
	Poorly run SMEs themselves (S16)	
	Weak cooperation with other actors in the supply chain (S17)	
	Careless choice of security in rem (S18)	
	People and information misconfiguration (S19)	
Third-Party Logistics companies	Misconduct by third party staff (S20)	Wu (2021)[9]
	Poor third-party messaging (S21)	
	High risk of third party operations (S22)	
	Inadequate third-party monitoring and coordination functions (S23)	
	Inadequate third-party risk control capabilities (S24)	
External environmental factors	Adverse fluctuations in the economic environment (S25)	Li & Nie (2021)[4]
	Insufficient national policy direction (S26)	
	Low level of application of emerging technologies (S27)	
	Insufficient supply chain stability in the industry (S28)	
	Instability of contingencies (S29)	

3. DEMATEL Method

The decision laboratory analysis method (DEMATEL) was proposed in 1971 by A. Gabus and E. Fontela of Battelle Laboratories in the United States. The DEMATEL model has the advantage that it takes into account not only the two direct influences between factors, but also the indirect influences among all factors.[10]

3.1 DEMATEL method steps

STEP1: Collect relevant data through expert interviews. Assume that the whole system contains n pieces of data $N_1, N_{2,}..., N_{n-1}, N_n$.

STEP2: Calculate the direct influence matrix. Based on the expert opinion and the actual situation, the strength of the direct influence relationship between the elements is determined, and the degree of influence between the elements is expressed by the numbers 0, 1, 2, 3 and 4, where 0 means "no influence", 1 means "very weak influence", 2 means "slightly weak influence", 3 means "slightly strong influence" and 4 means "very strong influence". The direct influence matrix is obtained by drawing a directed graph of the influence relationship A:

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

Where a_{ij} is the element i has an effect on the element j and n is the number of elements.

STEP3: Calculate the normalised direct relationship matrix. The elements in the matrix A are normalized to obtain the normalized direct relationship matrix B by the following equation.

$$B = A / \max_{1\le i\le n} \sum_{j=1}^{n} a_{ij} = \left(b_{ij}\right)_{n\times n} \tag{2}$$

STEP4: Calculating the combined impact matrix. By B self-multiplying the matrix and summing it to represent the increased indirect impact between the elements to obtain the integrated impact matrix S which is calculated as follows.

$$S = B + B^2 + \ldots + \mathrm{B}^n = \left(s_{ij}\right)_{n\times n} \tag{3}$$

When n is large is approximated by equation (4).

$$S = B \bullet \left(1 - B\right)^{-1} \tag{4}$$

STEP5: Determine the degree of influence and the degree of being influenced. Calculate the matrix S of the row sums u_i and column sums v_i with row sums u_i is the degree of influence and the column sum v_i is the degree of being influenced. u_i and v_i are calculated as follows.

$$u_i = \sum_{j=1}^{n} s_{ij} \tag{5}$$

$$v_i = \sum_{i=1}^{n} s_{ij} \tag{6}$$

STEP6: Determine the centrality and the degree of cause. u_i with v_i is the sum of the influences a_i the centrality of a_i the sum of the overall influence on the system and the combined influence of other factors on it, indicating the a_i The degree of importance of u_i The difference between v_i is the difference between a_i is the degree of causality of the influence factor, i.e.a_i influence on other influences minus the influence it receives, representing the a_i the net degree of influence. When (u_i - v_i) > 0, the influencing factor a_i has a greater degree of influence than it is influenced and becomes the causal factor. (u_i - v_i) < 0, the influence factor a_i is less than the degree of being influenced, and becomes the result factor. The central degree is C_i and the degree of cause is R_i and its calculation formula is as

$$C_i = u_i + v_i \tag{7}$$

$$R_i = u_i - v_i \tag{8}$$

follows.

4. ISM Method

Explanatory Structural Modelling (ISM) is a structured approach that was introduced in 1973 by Professor Warfield. The ISM model has a clear structure, easy to calculate, intuitive conclusions, easy to understand and high credibility.[11]

4.1 ISM method steps

STEP1: Defining the model elements. Firstly, the team and members of the ISM implementation team are identified, consisting of various actors from the relevant areas. Secondly, the specific issues are identified and finally, it is crucial to identify the set of factors for the analysis of the model, which will affect the effectiveness of the overall model application. It is therefore important to determine the set of factors by taking all aspects into account. The factor set is usually determined by discussion among the expert panel members, or by using the Delphi method. For systems with m factors, its factor set can be expressed as $S = \{S_1, S_2, ..., S_m\}$.

STEP2: Build the adjacency matrix G. The adjacency matrix shows the relationship that exists between any two elements in a square matrix, and if there are in the system Sm factors, then its adjacency matrix can be expressed as:

$$G = \left[g_{ij} \right] \tag{9}$$

$$g_{ij} = \begin{cases} 1 & \text{when } S_i \text{ has an effect on } S_j \\ 0 & \text{when } S_i \text{ has no effect on } S_j \end{cases} \tag{10}$$

STEP3: Solving for the reachable matrix M， The reachable matrix represents both the direct and indirect relationships of influence that exist between elements in a system. The reachable matrix is solved in the following way.

$$M = (A+I)^{k-i} \neq (A+I)^{k} = (A+I)^{k+1} \tag{11}$$

Where M is the reachable matrix, I is the unit matrix, and $(k+1)$ denotes the number of operations.

STEP4: Divide the factor hierarchy. There are four core operations for delineating factor hierarchies, including area delineation, loop judgement, edge reduction and hierarchy, which can be subdivided into the classic result-first hierarchy, the cause element hierarchy and the rotation approach hierarchy.

STEP5: Mapping the ISM model. After the calculation of the adjacency matrix and the reachability matrix, the influencing factors are then hierarchically divided, the explanatory structure model of the influencing factors is constructed, the relationships between the influencing factors are obtained, and finally the ISM model diagram is made according to the hierarchical relationships.

5. Result

5.1 DEMATEL calculations and analysis

In this paper, 29 supply chain finance risk factors were identified through literature research, taking into account five primary indicators: financial institutions, core enterprises, upstream and downstream SMEs, third-party logistics enterprises and external environmental factors, and the factors in the risk factor indicator system were evaluated to determine the level of influence by comparing them two by two. Three experts were invited to score the degree of direct influence between each two factors, classifying the degree of influence as very strong, strong, strong, weak and none, and assigning values of 4, 3, 2, 1 and 0 respectively. elements of the matrixa_{ij} representS_i the direct influence of a factor onS_j the degree of direct influence of the factor. After obtaining the expert questionnaire by counting and aggregating the recommendations of each expert, the direct influence matrix indicating the factors was obtained as shown in Table 2.

Table 2 DEMATEL direct impact matrix

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	S29
S1	0	2	1	0	0	1	0	2	0	0	0	0	2	0	0	0	2	0	1	0	0	1	0	0	0	0	2	0	0
S2	2	0	1	0	0	0	0	2	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0
S3	1	1	0	3	1	2	3	1	2	0	0	2	2	0	1	1	2	0	1	0	1	1	3	1	1	1	3	2	1
S4	0	0	3	0	0	3	0	0	1	0	0	0	2	3	2	0	1	0	0	0	0	2	0	1	0	2	2	0	1
S5	0	0	1	1	0	1	1	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	1	0	3	3	0	1	1
S6	1	0	2	1	0	0	2	1	0	0	0	1	1	0	1	0	1	0	0	0	2	1	1	1	3	1	1	0	0
S7	0	0	2	0	2	1	0	0	1	0	0	0	1	1	0	2	1	0	2	0	0	0	1	0	0	2	0	0	1
S8	2	2	1	0	0	1	0	0	1	0	0	1	2	2	0	3	2	1	0	0	0	0	0	0	0	0	0	0	0
S9	0	0	1	2	1	0	1	1	0	1	1	3	3	2	0	0	0	1	0	0	0	0	0	0	3	2	2	1	2
S10	0	0	0	0	0	0	0	0	1	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
S11	0	0	0	0	0	0	0	0	2	3	0	2	3	1	0	0	0	0	0	0	0	0	0	0	0	2	1	1	1
S12	0	0	2	0	1	1	0	1	3	0	2	0	2	1	1	0	2	3	1	0	2	1	3	1	2	2	2	1	1
S13	2	2	2	2	1	1	1	2	2	2	2	2	0	2	3	2	4	4	3	0	0	0	0	0	3	0	3	2	1
S14	0	0	0	3	0	0	1	2	2	0	1	1	2	0	2	4	1	2	1	0	0	0	2	0	2	3	0	0	2
S15	0	1	1	2	0	1	0	0	0	0	0	2	3	3	0	4	3	3	4	0	3	0	1	0	3	4	2	3	1
S16	0	0	1	0	0	0	1	3	0	0	0	0	2	3	4	0	3	2	3	0	1	0	1	0	4	3	1	2	1
S17	0	0	2	1	1	1	1	2	0	0	0	2	3	1	4	3	0	2	4	0	1	0	2	1	3	1	3	4	1
S18	0	0	0	0	0	0	0	1	1	0	0	3	3	2	3	2	2	0	3	0	2	3	2	2	0	1	2	0	1
S19	1	0	1	0	0	0	2	0	0	0	0	1	3	1	4	3	3	3	0	0	2	0	2	0	0	0	3	0	0
S20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	3	1	0	0	0	0	0
S21	0	0	1	0	0	2	0	0	3	1	2	2	2	3	0	0	2	2	2	3	0	0	2	1	2	1	3	2	1
S22	1	0	1	2	0	1	0	0	0	0	0	4	0	1	0	0	0	4	0	1	0	0	0	2	1	2	2	3	1
S23	0	0	3	0	1	1	1	0	0	0	0	3	0	2	4	1	2	2	2	3	4	0	0	1	0	2	2	0	1
S24	0	0	1	1	0	1	0	0	0	0	0	1	0	0	0	0	1	2	0	2	1	2	1	0	1	2	3	1	1
S25	0	0	1	0	3	3	0	0	3	0	0	2	3	2	3	4	3	0	0	0	2	1	0	1	0	4	1	4	1
S26	0	0	1	2	3	1	0	2	1	2	2	0	2	4	3	1	1	1	0	0	1	3	2	2	4	0	2	2	1
S27	3	1	2	2	0	4	0	3	0	1	2	2	0	2	1	3	2	2	3	0	3	1	3	3	3	2	0	3	2
S28	0	0	2	0	1	0	0	0	2	1	2	1	3	0	3	2	4	0	0	0	3	2	0	1	4	2	2	0	1
S29	0	0	1	1	1	0	1	0	2	0	1	1	2	2	1	1	1	1	0	0	1	1	1	1	1	1	2	2	0

The values of the various DEMATEL indicators, including influence degree, affected degree, centrality and casual degree, were calculated.

Influence degree represents the combined influence of an element on other elements, with higher values representing greater influence. Affected degree is the combined influence of an element on other elements, with higher values representing greater influence. Centrality indicates the size of the role of an element in the system, with a higher value representing a more important element. Casual degree is greater than zero, which means that it has more influence on other factors, and less than zero means that it is a result factor, which means that it is influenced more by other factors.

By calculating the known index values, using centrality as the x-axis and casual degree as the y-axis, a plane right angle coordinate system is established and the factor points are plotted to form a centrality-casual degree relationship diagram as shown in Figure 2.

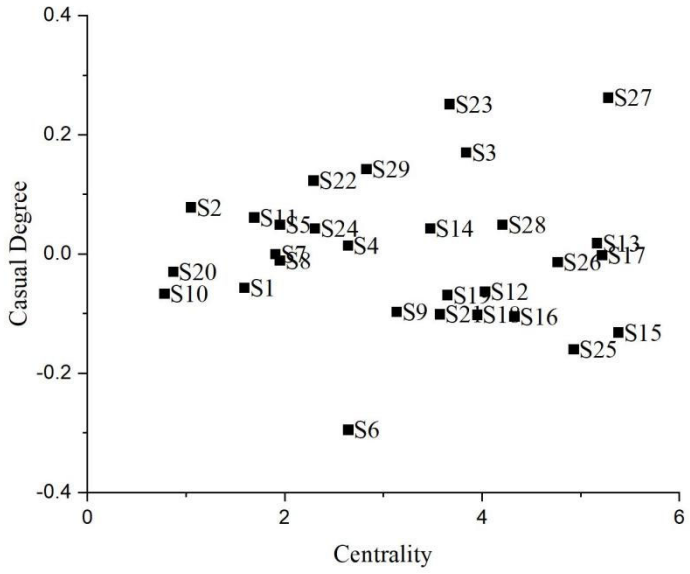

Figure 2. Centrality-causality diagram

As can be seen from the figure, the factors in the first quadrant are of high importance and are causal factors, which are regarded as critical factors due to their high casual degree and centrality, so

the critical factors include S3, S13, S14, S17, S23, S27, S28. The factors in the fourth quadrant are of high centrality and low casual degree, i.e. S12, S15, S16, S18, S19, S21, S25 High importance and outcome factors. The second three quadrants have low centrality, i.e. they are unimportant factors.

Using the influence degree as the x-axis and the affected degree as the y-axis, a planar right-angle co-ordinate system is established, and the resulting influence degree -affected degree relationship is shown in Figure 3 below.

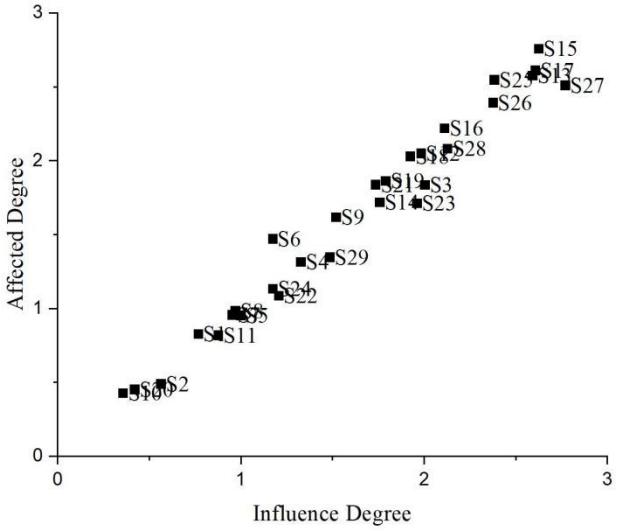

Figure 3 Influence - Influenced graph

The figure shows that 1.61 is the average of the influence degree or affected degree. The first quadrant represents a high influence degree and affected degree, and the six factors S15, S17, S13, S27, S25 and S26 all have a much higher degree of influence and being influenced than the average. All the factors are concentrated in quadrant one and four, with quadrant four representing a lower than average level of influence and being influenced, which can be considered as non-critical factors with a low level of influence and being influenced.

a)Influence degree analysis.

From the table, we can see that the top scoring risk factors in supply chain finance are low level of application of new technology (S27), unfavourable cooperation with other actors in the supply chain (S17) and unfavourable cooperation with upstream and downstream actors in the supply chain (S13), indicating that these three factors tend to influence other factors. It can be seen that the application of new technology and cooperation with various main actors in the supply chain have a greater degree of combined influence on other factors, so the risks in these two areas need our attention.

b) Affected degree analysis.

The higher ranked influenced degree values are distortion of information disclosure and delivery by SMEs (S15), unfavourable cooperation with upstream and downstream supply chain players (S13), unfavourable fluctuations in the economic environment (S25) and low level of application of emerging technologies (S27), which are more influenced by other factors.

c) Centrality analysis.

The top four factors are distorted information disclosure and transmission by SMEs (S15), low level of emerging technology application (S27), unfavourable cooperation with other subjects in the supply chain (S17), and unfavourable cooperation with upstream and downstream subjects in the supply chain (S13), indicating that these four factors are important supply chain finance risk influencing factors, i.e. addressing these four aspects has a significant effect on reducing supply chain finance risk.

d) Casual degree analysis.

The highest ranked causal factor was low levels of emerging technology adoption (S27), indicating that it was most susceptible to other factors. The highest ranked outcome factor was insufficient

application of information technology (S6), indicating that it was most susceptible to other factors. Low levels of emerging technology adoption (S27) and inadequate third-party supervision and coordination functions (S23) are in the top two of the causal factors, suggesting that inadequate technology adoption and the failure of third-party logistics companies largely influence supply chain finance risk.

5.2 ISM calculation and analysis

To simplify the analysis of the system structure, a threshold value is introducedλ that removes the less influential relationships in the combined influence matrix Tλ =x+σ , x is the mean of all factors in the combined influence matrix, andσ is the standard deviation. The calculation givesλ = 0.0975, when the value of an element of the combined influence matrix is greater thanλ the element of the adjacency matrix is set to 1, and when the value of the element is less thanλ. Thus, the adjacency matrix for the ISM calculation is extracted from the DEMATEL integrated impact matrix. In order to simplify the hierarchy diagram, five key factors S13, S15, S17, S25 and S27 were eliminated due to the excessive influence and influence of the key factors, which would lead to an overly complex hierarchy diagram.

The reachable matrix is hierarchically decomposed to further determine the intersection of the reachable set and the prior set of each risk factor. Based on the relationship between the reachable set and the prior set, the factors are extracted hierarchically and a hierarchical decomposition table 5 is obtained as follows.

Table 3 Hierarchical decomposition table

Levels	Key elements
Level 1 (top floor)	S1,S2,S4,S5,S6,S7,S8,S10,S11,S20,S21,S22,S24,S29
Level 2	S9,S12,S14,S16,S18,S19,S26,S28
Level 3	S23
Level 4 (ground floor)	S3

The result of the hierarchy is obtained through area division, loop judgement, edge reduction and hierarchy division, according to which the hierarchy can be drawn as shown in Figure 4 below. The second and third layers are the intermediate influences, also known as transitional causes.

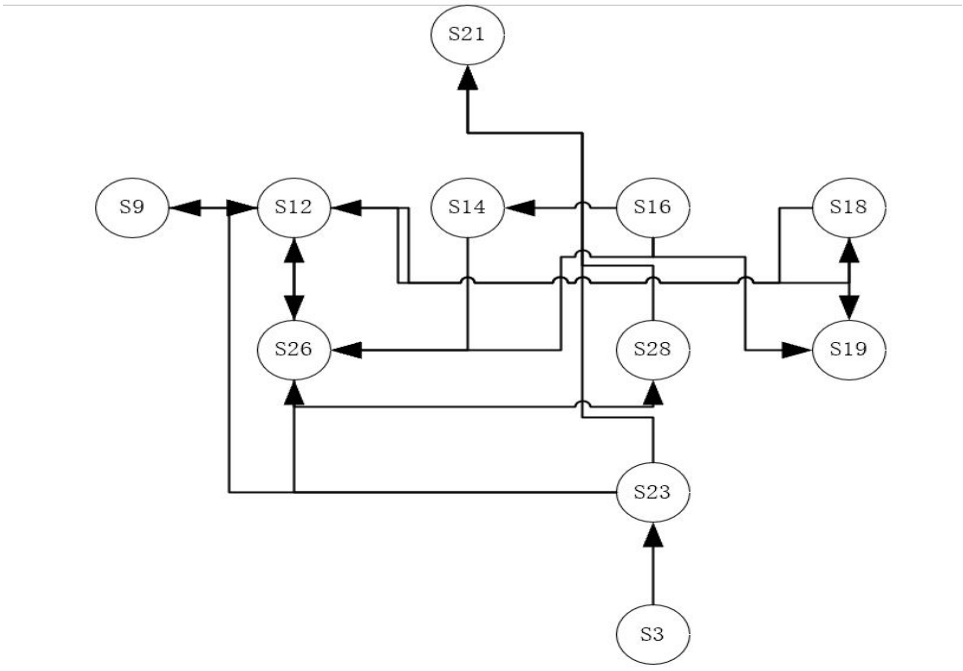

Figure 4. ISM hierarchy

Unfavourable third-party information transmission (S21) is a superficial causal factor, while insufficient information access and transmission bias (S3) is at the bottom, indicating that insufficient information access and transmission bias (S3) are the fundamental influencing factors and the key factors of supply chain finance risk. Fluctuating industry status of core enterprises (S9), distorted information disclosure and transmission (S12), moral hazard problems (S14), unfavourable business operation of SMEs (S16), careless choice of security in rem (S18), misallocation of personnel information (S19), insufficient national policy guidance (S26), insufficient stability of industry supply chain (S28), and inadequate third-party supervision and coordination functions (S23) are the deeper factors. (S23) are deep-rooted influencing factors.

According to the ISM multilevel hierarchical diagram, there are four levels of supply chain finance risk indicators, which are analysed and evaluated by a panel of experts, and are more in line with the risk factors that arise in supply chain finance. The hierarchy diagram shows that inadequate access to information and transmission bias (S3) are the root causes of most risks in supply chain finance. The monitoring and control of the direct influence of third-party information transmission (S21) and the deeper influence may reduce the occurrence of risk for a short period of time, but in the long run it does not solve the risk problem of supply chain finance at the root. Therefore, supply chain finance risks are superficially caused by unfavourable information transfer from third-party logistics companies, but solving the information transfer problem of logistics companies alone cannot prevent new risks from arising at the root. What needs to be solved is the problem of information access and transmission bias of core financial institutions, and information asymmetry is a common and unavoidable problem among financial institutions, which can be effectively dealt with through credit guarantees and additional costs.

6. Conclusion

6.1 Analysis of DEMATEL results

The low level of application of emerging technologies (S27) is the most essential and critical fundamental factor affecting supply chain risks. All supply chain players should fully understand the key role of technological updates in various fields and vigorously promote the application of new technologies. The high impact of unfavourable cooperation with upstream and downstream actors in the supply chain (S13) and unfavourable cooperation with other actors in the supply chain (S17) reflects the need to strengthen the links and cooperation among all links in the supply chain finance. The lack of third-party supervision and coordination (S23) will also have an impact on the overall development of supply chain finance, and strengthening partnerships through external supervision is crucial in enhancing the safety and liquidity of supply chain finance.

6.2 Analysis of ISM results

The superficial cause of supply chain finance risk is poor third-party information transfer (S21), reflecting that poor logistics and information flow transfer is the main risk factor of overall supply chain finance. More risk factors leading to poor information flow and logistics linkage are found in the core enterprises, external environmental factors and third party logistics companies. Further research found that the deeper reason for the above-mentioned multiple factors is insufficient information access and transmission bias (S3). This shows that information flow is crucial to the integration of supply chain finance, and the most important factor influencing the risk of supply chain finance is information flow-related factors. Choosing the right third-party company can help to avoid the risk of capital flow. The key to fundamentally reducing risk lies in the financial institution's access to and analysis of information throughout the supply chain, as well as the information that is passed on to the subjects in each link. Financial institutions can reduce credit risk in various ways, and combine information platforms, cloud storage and big data to better combine capital flow and information flow, thus driving smooth communication between logistics and commercial flow, and driving the steady development of a supply chain with four streams in one.

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