Analysis of Factors Affecting SCF Digital Transformation Activities. Pilot for Banks/Financial Institutions in Vietnam

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Abstract: - One of the important tasks in enterprises' supply chain operations today is the supply chain financing activities of sponsoring organisations (banks) to ensure the supply chain is sustainable, avoids disruptions and interruptions, and helps enterprises operate regularly and continuously. The article will analyse factors affecting the effectiveness of SCF and propose solutions for integrating digital transformation technology into SCF operations at banks, based on current SCF and digital SCF implementation at banks. The article uses a questionnaire designed on a Likert scale with 5 levels and conducts convenience sampling at 25 banks, 5 branches/banks and 5 bank officers/branches. Survey data will be synthesised, analysed and processed through the statistical analysis program SPSS 20.0, and Cronbach's Alpha testing. On that basis, the article also proposes some solutions with policy implications to support improving the effectiveness of the digital transformation of SCF operations at Vietnamese financial institutions.

Key-Words: - Supply chain, SCF, influencing factors, digital transformation, SCF Bank, Sponsorship.

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1 Introduction

In the trend of globalisation, one of the indispensable tools for global connection is digital transformation. Today, we are living in the digital era, and supply chain activities are no longer limited to a province, region, or country but have a global supply chain scope. Therefore, the supply chain is a tool to connect stakeholders in activities from production, processing, and distribution to end users, and the success of enterprises in their production and business activities cannot be without supply chain management activities, which have developed into an important foundation. However, in the past year, after the COVID-19 pandemic, the number of newly established enterprises has always been smaller than the number of enterprises withdrawing from the market. Among the enterprises withdrawing from the market, the majority are due to a lack of capital and not getting orders. This shows the disruption and interruption in supply chains. Therefore, financial institutions/banks play an important role in maintaining the sustainable operation of enterprises. Banks can inject capital for businesses to operate, but the reality is that it is very difficult for businesses to access capital from banks, due to many different conditions, while banks are stuck with capital. Moreover, the complex interaction of factors and the continuous transformation of the business context pose significant challenges in maintaining effective supply chain operations. This is a current paradox, requiring banks/financial institutions to have effective and breakthrough solutions to help businesses access capital quickly and immediately when needed to ensure that the supply chain is maintained and not disrupted.

In order to address capital needs and maintain competitiveness for businesses in recent years, banks have offered various supply chain financing packages for businesses, and preliminary surveys have shown that SCF activities have been effective.

In the context of digital transformation, many banks have researched and implemented SCF to support businesses quickly and promptly. The application of digital transformation to supply chain management is considered strategic, promising significant advantages, with the ability to analyze large data sets, forecast trends, optimize operations and automate routine tasks, and minimize the risk of errors, allowing organizations to respond promptly to disruptions, minimize downtime and improve overall business satisfaction. To have objective analysis and assessment of the current status of SCF operations and SCF digital transformation of banks in the current period to propose effective solutions, improve SCF digital transformation activities at banks, and support businesses better in supply chain operations [1], [2], [3], [4]. Therefore, the study and

analysis of factors that positively impact the effectiveness of SCF operations and the digital transformation of SCF serve as a basis for promoting the application of digital SCF operations in banks. The structure of the article includes 4 main parts: 1) General introduction to the role of SCF and digital SCF in banks; 2). Introduction to theoretical basis and research methods; 3). Analysis of research results; 4). Conclusion and some recommendations for management implications.

2 Theoretical Basis and Research Methodology

2.1 Theoretical basis

The term "Supply Chain" has many different views. In this article, the supply chain is understood as a closed, comprehensive connection system between components, including people, organisations, information, organisational activities, and all related forces (directly and indirectly) to carry out production, processing of products, and then distribute and transport to final consumers [5], [6].

A sponsoring organisation (bank) is understood as an activity in which the sponsoring party (bank) will sponsor another party (business, individual, etc.) in the form of material or financial resources for a certain independent activity in exchange for a certain benefit that the activity itself brings.

Supply chain financing is a form in which banks will finance businesses in the form of physical and financial resources to support the business's supply chain activities of goods and services, ensuring that operations are maintained and not interrupted or broken during the production, processing, and distribution processes [2], [7], [8], [9]. *Below is a diagram illustrating the process of financing the supply chain of goods and services (Figure 1):*

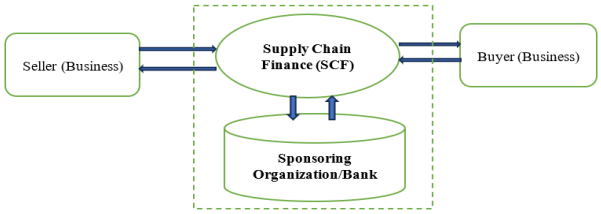

Fig. 1: Diagram illustrating the operation process of traditional SCF

Source: Author's proposed study

In a market economy with global competition, businesses in general and banks/credit institutions in particular are not out of the trend. As more and more commercial banks are established, they meet the capital needs of businesses. Therefore, banks must also compete with each other, offering many different forms of loans and financing for businesses, so that more and more business customers come to them. One of the effective solutions today is for businesses to launch new products and loan packages with increasingly short life cycles, meeting the increasing expectations of businesses. One of the outstanding solutions in recent times that most banks have offered is to finance the supply chain activities of businesses, to help ensure that the supply chain activities of businesses are maintained sustainably, regularly and without interruption, avoiding interruptions [10], [11], [12], [13], [14].

In the world, according to Hofmann's research [7], banks or SCF sponsoring organisations have implemented SCF digital transformation to support businesses. Through this activity, it helps banks deploy quickly and conveniently to businesses. At the same time, SCF activities will be reviewed and assessed automatically, helping to reduce review time, save time for funding businesses, and reduce human resources for banks [15], [16], [17]. As for businesses, they will quickly access the SCF package through digital transformation activities [8],[18],[19], helping businesses get instant capital, meeting capital needs in a short and fast time. In addition, with a financial approach based on SCF, it will create sustainability in cash flow needs for businesses in the supply chain [20].

In Vietnam, SCF is still quite new and has only appeared in the last 5 years. However, to date, there have been many studies on SCF activities and the digital transformation of SCF by financial institutions to support businesses [21], [22], [23], [24]. However, the survey shows that the number of banks applying the supply chain financing package is still limited, especially for newly established banks, most of which have not applied SCF. Meanwhile, traditional and large banks have applied the SCF package for businesses such as BIDV, SHB, Techcombank and VietinBank have deployed the digital SCF system to meet the needs of diversity and flexibility for businesses in accessing capital needs, while contributing to accelerating the speed of digital financing transactions, increasing transparency, and increasing the ability to support businesses with the feature of updating information and reporting in SCF transactions based on a digital platform.

Thereby providing business customers with the most optimal and modern financial solution to keep up with global trends [25], [26], [27]. Among the banks that have applied the SCF package, some banks have applied SCF digital transformation technology to support domestic and international businesses in the fastest way, promptly meeting the cash flow needs of businesses. With BIDV bank,

funding for satellite businesses is provided through the chain of links between three parties: Bank - Central business - Satellite business [26], [28]. Asia Commercial Bank (ADB) signed with Standard Chartered Bank to deploy the SCF package for small and medium enterprises. Orient Commercial Bank (OCB) provides trade finance services as well as financing for business suppliers. In addition to the benefits that SCF brings to businesses, there are also articles pointing out the opportunities and challenges in the industrial supply chain. The APEC-APFF-FIND Conference in Vietnam also affirmed the role and value of SCF in the supply chain operations of businesses in the globalisation trend [22].

However, SCF activities are still very limited. Most of the enterprises participating in SCF activities are still mainly large and reputable enterprises. In fact, according to BIDV, in order for enterprises to participate in the SCF package, it is required that the central enterprise has highly competitive products, a famous brand and a large consumer market. The enterprise's suppliers have at least 2 years of transactions with the central enterprise and are considered to be the main and reputable input enterprises. With the criteria for selecting central enterprises and satellite enterprises of banks, not all enterprises can meet the requirements. For small and medium enterprises, the issue of establishing a supply chain and implementing SCF faces many obstacles because it requires enterprises to spend a lot of money and time to implement. However, not all enterprises are able to accept this cost, especially small and medium enterprises.

Thus, through the above analysis, it can be seen that SCF activities have brought many benefits to all parties involved in SCF activities, especially SCF digital transformation, which brings even greater benefits. However, to have an objective view, in this article, the author analyses the factors that influence and positively impact SCF activities and SCF digital transformation at banks/financial institutions through a survey of banking organisations on whether or not they have implemented SCF and SCF digital transformation at banks in the recent past.

2.2 Research Model

The research model is built based on the inheritance of the results of previous theoretical studies. The group of authors built a research model with 5 factors affecting the SCF performance of banks *(Details in Figure 2).*

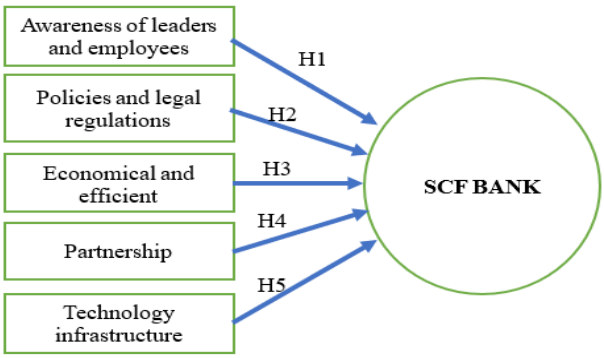

Fig.2: Research model

Source: Author's proposed study

Based on the actual survey of SCF activities at banks and through research, analysis and evaluation of SCF activities through research documents and scientific works of other domestic and international authors, the author of the article has proposed 20 research hypotheses, which are also 20 observed variables in the analysis of factors affecting SCF at Vietnamese banks, specifically:

H1: Awareness of leaders and employees

H11: "*The commitment and interest of the management"* in promoting supply chain finance activities will directly influence the bank's policies and strategies.

H12: "*The fit between the bank's development strategy"* and long-term supply chain finance goals.

H13: "*Expertise and ability to handle complex transactions"* in the supply chain finance of the staff.

H2: Policies and legal regulations

H21: "*Interest rate, conditions and credit limits policies"* affect banks' ability to support supply chain finance.

H22: "*Relevant regulatory requirements*" for supply chain finance influence banks' credit decisions.

H23: "*Risk analysis tools and techniques*" that banks use in evaluating supply chain finance loans.

H24: "*A clear, fast, easy-to-use 'credit approval process*' impacts the speed and quality of supply chain financing.

H25: "*Ability to monitor and audit SCF activities*" to ensure effectiveness and efficiency.

H26: "*Ability and quality of collateral*" that a business can provide to a bank affects the decision to grant credit.

H27: "*Level of transparency and openness*" of a bank in its supply chain financing activities will affect the trust of partners.

H3: Economy and efficiency

H31: "*Economic conditions*", including interest rates, exchange rates and financial market volatility, affect bank financing activities.

H32: "*Integration and efficiency*" of information management systems in monitoring and managing financing.

H33: "*Costs associated*" with supply chain financing transactions.

H34: "*Effectiveness of cooperation*" between banks and supply chain partners to design appropriate financing products.

H35: "*Creditworthiness and credit history*" of enterprises will determine the ability to access financing from banks.

H4: Partnership

H41: "*Cooperation between banks and international financial institutions*" can provide supply chain financing or guarantees.

H42: "*Cooperation between banks and enterprises*" in developing supply chain finance products.

H43: "*Capacity of banks to mobilise capital*" to provide credit for supply chain finance activities.

H5: Technology infrastructure

H51: "*Data security and safety measures*" affect the trust of stakeholders in the supply chain.

H52: "*SCF Digital Transformation*" including electronic payment systems, digital banking services.

The study of the article used a combination of qualitative and quantitative research methods. Quantitative research was conducted through primary data collection from a survey of 25 different banks; each bank had a survey group at 5 branches. For each bank branch, the author surveyed 5 officers. Thus, in total, the author group surveyed 25*5*5= 625 people, using a questionnaire designed on a Likert scale with 5 levels and a convenient sampling of 25 banks. The survey was conducted from March 2025 to April 2025. Data was processed and analysed through the SPSS 20.0 statistical analysis program, and data analysis used charts automatically synthesised from the Google Form system.

3 Research results

Based on theoretical studies on supply chains, supply chain finance and especially research results related to SCF activities at domestic and foreign banks, the author has proposed a research model with hypotheses including 5 influencing factors with 20 observed variables. The author has designed a questionnaire and asked 625 bank officers and leaders. In this section, the author presents the results of reliability testing for the survey results to provide analysis and propose solutions.

3.1 Cronbach's Alpha Test

This section will present the results of the scale testing to achieve reliability, with Cronbach's Alpha coefficient ranging from 0.691-0.870 (>0.6). The results of testing 5 influencing factors with a total of 20 observed variables show that all have a total variable correlation index >0.3, which means that all meet the requirements (*See Table 1 for details of the testing results*).

Table 1. Scale testing results

Observation	Total variable	Cronbach's Alpha
Awareness of leaders and employees: Cronbach's Alpha = 0,792		
H11	.745	.827
H12	.782	.786
H13	.646	.772
Policies and legal regulations: Cronbach's Alpha = 0,870		
H21	.690	.819
H22	.673	.856
H23	.670	.895
H24	.675	.866
H25	.674	.892
H26	.718	.889
H27	.675	.875
Economical and efficient: Cronbach's Alpha = 0,770		
H31	.718	.789
H32	.656	.812
H33	.636	.671
H34	.748	.779
H35	.682	.787
Partnership: Cronbach's Alpha = 0,691		
H41	.653	.736
H42	.568	.635
H43	.611	.716
Technology infrastructure: Cronbach's Alpha = 0,816		
H51	.718	.812
H52	.778	.820

Source: Author's calculation

3.2 Exploratory Factor Analysis (EFA)

The test results show that the KMO coefficient = 0.776 (> 0.5), so the EFA analysis results ensure reliability. Bartlett's test has a Sig. Coefficient = 0.000 (< 0.05), showing that the observed variables are correlated with each other in the factor group; the factor analysis results ensure statistical significance (*Detailed analysis results see Table 2 below*).

Table 2. KMO and Bartlett test

KMO Test		,776
Bartlett test	Chi-square value	4156,692
	df	486
	Sig.	,000

Source: Author's calculation

The EFA analysis results in the extraction of 6 factors with a total variance of 58.016% (See Table 3 for details of the analysis results). The eigenvalues (the variation explained by each factor) of the factors are, respectively: Awareness of leaders and employees (2.389); Legal policies and regulations (5.528); Economy and efficiency (4.051); Cooperation (2.225); Technology infrastructure (1.512); SCF Bank (1.450). The rotation matrix results in the EFA analysis ensure discrimination, the convergence value of the variables on the factors are all > 0.5, higher than the required level. Therefore, all observed variables are included in the next analysis.

Table 3. EFA analysis results

Factors						
	1	2	3	4	5	6
H11	,801					
H12	,812					
H13	,783					
H21		,912				
H22		,821				
H23		,735				
H24		,726				
H25		,892				
H26		,793				
H27		,732				
H31			,831			
H32			,823			
H33			,798			
H34			,836			
H35			,766			
H41				,918		
H42				,721		
H43				,613		
H51					,778	
H52					,724	
SCFBank1						,926
SCFBank2						,568
Eigenvalues						
Extracted variance %						

Source: Author's calculation

3.3 Linear Regression Analysis

Model Fit Testing

Adjusted R2 coefficient = 0.213, meaning that the 5 independent variables explain 21.3% of the variation of the dependent variable, or in other words, the independent variables explain about 21.3% of the variance of the dependent variable (see details below Table 4). In the ANOVA table, we have Sig.=0.000<0.05, which shows that the model fits the population.

Table 4. Multiple regression model results

Model	R	R^2	adjust R^2	Standard error
1	,452[a]	,226	,213	,51012

Source: Author's calculation

Analysis of Variance ANOVA

The analysis results in Table 5 show that the F value has a significance level of Sig.F=0.000<0.05, which means that the proposed linear regression model is consistent with the actual data collected and the included variables are all statistically significant at a significance level of 5%.

Table 5. Analysis of variance ANOVA[a]

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	17,155	8	2,144	8,576	,000[b]
	Remainder	62,325	256	,243		
	Total	79,480	264			
a. Dependent variable: SCFBank						
b. Independent variable (Constant), H1, H2, H3, H4, H5						

Source: Author's calculation

Regression Coefficient

The variance inflation factor (VIF) of the independent variables is < 10, indicating that the independent variables in the model are not closely related to each other, so there is no multicollinearity (details in Table 6). Therefore, the relationship between the independent variables does not significantly affect the explanatory results of the regression model.

Table 6. Regression analysis results

Model	Unstandardized regression coefficients		Standardised regression coefficient	t	Sig.	Statistics multicollinearity	
	B	Standard error	Beta			Tolerance	VIF
(Constant)	1,572	,246		4,572	,000		
H1	,117	,051	,189	3,182	,045	,724	1,136
H2	,218	,056	,283	4,382	,000	,902	1,127
H3	,196	,052	,265	4,130	,036	,873	1,108
H4	,070	,037	,109	1,956	,065	,925	1,104
H5	-,029	,040	-,035	-,482	,529	,932	1,032

Source: Author's calculation

Based on the regression analysis results in Table 6, it shows that testing the significance of the regression coefficient for 5 factors affecting the effectiveness of SCF operations of banks for enterprises in Vietnam province shows that there are 2 variables, H4, H5, with Sig. > 0.05, not statistically significant, so they were eliminated from the model. The remaining 3 variables, H1, H2 and H3 have standardised Beta coefficients of 0.189, 0.283 and 0.265 respectively, so they have a positive impact on the effectiveness of SCF application implementation of banks in actively supporting enterprises in supply chain operations (*see details in Table 6*).

4 Discussion

Based on the above regression analysis results, important factors affecting the intention to apply the SCF digital transformation of banks in supply chain finance activities for enterprises in Vietnam have been identified. Among the 5 main groups of factors, some factors have positive impacts, and factors that have negative impacts on the implementation of SCF digital transformation, especially reflecting the difficulties and challenges that banks face when implementing SCF digital transformation for enterprises in the current period.

The problems encountered when banks implement SCF digital transformation for businesses are indicated as follows:

With factor H1: Awareness of leaders and employees

The awareness of leaders and employees has a positive impact on SCF digital transformation activities, but still at a lower level (Beta = 0.189, Sig. = 0.045). This result shows that innovation and raising awareness of leaders and employees have a positive impact on the intention or decision to deploy digital transformation solutions for SCF activities of banks for businesses. However, to achieve this effect, banks/credit institutions need to deploy solutions to disseminate, propagate, educate and train leaders and employees with knowledge and show them the benefits that implementing SCF digital transformation solutions will bring to the bank in credit activities.

With factor H2: Legal policies and regulations

The analysis in Table 6 shows that Policies and legal regulations on digital transformation of SCF operations at banks, as well as implementation for enterprises in Vietnam, are the factors with the strongest positive impact (Beta = 0.283, Sig. = 0.000). The analysis results show that, to successfully implement the application of digital transformation solutions for SCF operations at banks, policies and

legal guidelines are very important, because SCF operations deployed in the digital environment can lead to many risks regarding infrastructure, data, information, as well as the security and safety of digital assets of enterprises. Therefore, when policy factors are supported by the state, built into policies to promote and legal tools are built to protect the interests of businesses when participating in SCF activities in the digital environment implemented by banks, it will bring confidence to businesses, and they will actively participate.

With factor H3: Economy, efficiency

Measuring the economic and efficiency of credit business operations through the SCF digital transformation solution of banks plays a key and important role in deciding whether to implement it or not. In particular, the SCF digital transformation solution of banks for businesses also needs to measure the economic and efficiency, serving and supporting businesses to have cash flow quickly and promptly is also an important factor. The analysis results show that with the economic and efficiency (Beta = 0.265, Sig. = 0.036), it shows that the implementation of the SCF digital transformation solution at banks has brought positive impacts on the economy and efficiency for both banks and businesses.

With factor H4: Cooperative relationship

Based on the analysis results for the cooperative relationship factor (Beta = 0.109, Sig. = 0.065), it shows that building cooperative relationships between banks and between banks and businesses has a positive impact on the effectiveness of implementing SCF digital transformation at banks. However, the above analysis results show that to successfully implement the SCF digital transformation solution at banks and effectively serve businesses, banks need to build more cooperative relationships between banks to jointly create an environment to promote this solution and create trust and satisfaction with businesses, attracting businesses to participate in SCF activities in the digital environment.

With factor H5: Technology infrastructure

Technology infrastructure is an important factor with a positive impact (Beta = - 0.035, Sig. = 0.529), with a negative Beta value showing that when implementing SCF digital transformation applications, banks will encounter difficulties and obstacles due to technology infrastructure not meeting the requirements for security measures, ensuring safety and operating the system. Therefore, banks need to upgrade technology infrastructure, create close links between departments to ensure efficiency, while ensuring the requirements for security and data safety. Thereby, it will help businesses have more confidence when participating in SCF in the digital environment that the bank deploys.

5 Conclusion and Management Implications

Digital transformation of SCF activities at banks/credit institutions in the current period is an inevitable trend, contributing to innovation in operating methods and improving the quality of SCF activities. At the same time, it brings trust, satisfaction and timely response to cash flow/capital needs for businesses when participating in SCF activities in the digital environment. Through research, survey and analysis of the above results related to factors affecting the SCF digital transformation activities of banks, the article has pointed out 02 factors that have a direct and strong positive impact on the effectiveness of digital transformation application implementation in SCF activities, which are: *Legal policies and regulations; Economic and efficiency*. Besides, there is 01 positive influencing factor, which is the *Awareness of leaders and employees*.

To improve the effectiveness of SCF digital transformation, banks/financial institutions in Vietnam should shift their mindset from digitalising credit processes to building a reliable, interconnected and open supply chain data platform. When data becomes a trusted asset, banks become the centre for coordinating capital flows and trust in the digital economy. Based on the results of empirical analysis, the study provides some explanations for the following management implications:

- Solution implications for organisation, management and awareness:

+ *On awareness and determination:* Because the implementation of digital transformation applications into SCF operations has shown the effectiveness it brings to the bank. However, the conversion from the traditional SCF model to the digital SCF model still requires determination and understanding in terms of awareness from leaders to employees of the entire banking system to ensure that the application of digital transformation into SCF operations is fast, effective and convenient, creating trust for businesses.

+ *Standardise SCF internal processes:* Standardise and transform SCF business processes from a distributed approval model to an approval flow automation model based on real data and risks when implementing digital SCF.

+ *Establishment of "Digital SCF Operation Hub":* responsible for coordinating, analysing chain data and providing insights for the process of receiving, reviewing, deciding on funding and disbursing funding.

- Implications for policy, regulation and cooperation:

+ *On policies and legal regulations:* it is necessary to build an open legal framework, and financial institutions coordinate with the State Bank and the Ministry of Finance to complete the corridor for data sharing, digital signatures, and electronic identification. Because the application of digital transformation to SCF activities is deployed in a digital environment, all data and assets of banks, as well as enterprises participating in SCF, will be stored and transacted in a digital environment. Therefore, the digital SCF solution needs to be supported in terms of policies and have legal regulations from state management agencies, from the bank itself, to ensure the rights of the participating parties, especially enterprises, so that they can feel secure and have confidence in digital SCF.

+ *About Cooperation:* Banks need to build a cooperative ecosystem to provide digital SCF services to be effective. Banks need to build cooperative relationships and receive positive responses from businesses. To do so, banks need to build good relationships and create trust with businesses so that they actively participate in using digital SCF services.

- Solutions on financial efficiency: Although the bank has effectively exploited and used SCF services for businesses, when implementing the conversion of the traditional SCF service model to the digital SCF service model, there may be many difficulties and related risks. Therefore, the bank needs to have measurements, evaluate potential risks and carefully analyse the economic situation, efficiency and costs to ensure that the implementation of the digital SCF service will be highly effective. Banks also need to set expectations when implementing SCF digital transformation solutions: Ensure shortened SCF processing time. Open, transparent data, reducing the risk of fraud and duplicate invoices. Increase businesses' access to capital and shift banks from the role of "financier" to "data trust coordinator" - creating long-term competitive advantages.

- Solutions on technology infrastructure:

+ *Technology infrastructure equipment:* To operate digital SCF activities regularly and securely, banks need to invest in upgrading technology infrastructure in both hardware and software to ensure security measures and data safety for banks and business records. In particular, ensuring the timely and regular provision of digital SCF services for businesses performing SCF transactions. Deploy a hybrid cloud computing model with edge computing to ensure flexible processing, data security and fast retrieval between supply chain nodes.

+ *Provide a digital SCF data integration platform, including:*

✓ Standardise and integrate data: Build open APIs, shared data warehouses and information exchange standards to connect participants in the chain.

✓ Research and deploy the application of advanced technologies such as AI, Big Data, and Blockchain into developing dynamic credit analysis tools based on actual transaction data in the chain (orders, bills of lading, electronic invoices, etc.) instead of just based on credit transaction history. At the same time, build a smart contract solution using Blockchain, then each SCF transaction (invoice financing, factoring, order discounting, etc.) is recorded transparently, cannot be modified, creating trust in data linkage between participants in the chain.

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