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## Research on Credit Evaluation System of E-business Enterprises from The Perspective of Organizational Resilience Theory

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### ABSTRACT

With the rapid development of the electronic business industry and the widespread of information technology, the credit issue of e-business enterprises becomes more and more important. Traditional e-business credit evaluation focuses on the accumulation of transaction credit. However, the widespread phenomenon of credit brushing leads to the deviation of credit evaluation of e-business enterprises. To improve the effectiveness of the credit evaluation system, this study introduced resilience-related indicators which represent the dynamic capability and sustainability of enterprises into the credit evaluation system. According to the organizational resilience theory, we capture e-business enterprises' credit from three dimensions: basic ability symbols, transaction process, and consumer feedback toward transaction outcomes. The potential influence of integrity grade, repeat purchase rate, return rate, and customer satisfaction were considered to mitigate the influence of deception on a credit evaluation. Combined with the analytic hierarchy process, this study constructed an adjusted credit evaluation model of e-business enterprises from the perspective of organizational resilience and tested the model with data from the Alibaba website. Fifteen considerable women's clothing e-business enterprises were selected for credit comparison. Results show that the top enterprise mainly had advantages over other enterprises in terms of the high repeat purchase rate, low return rate, and high consumer satisfaction. Theoretically, our study contributes to enriching the credit evaluation model of e-business enterprises and making an extension on the application of organizational resilience theory. In addition, these findings are helpful to optimize the effectiveness of credit evaluation of e-business enterprises, provide practical implications for e-business enterprises by identifying the key indicators to improve their credit in the uncertain trading environment, and reduce the transaction risk of e-business platforms.

*Keywords:* E-business, credit evaluation, analytic hierarchy process, cluster analysis, organizational resilience theory.

### INTRODUCTION

Enterprise credit has always been a critical concern in the e-business environment. Especially in the context of the COVID-19 pandemic, which has brought about delays in production and shutdown transactions, the credit of e-business enterprises has become increasingly important (Bhatti *et al.*, 2020; Jílková & Králová, 2021). Many e-business websites have established credit evaluation systems for e-business enterprises to reduce uncertain risks such as asymmetric information in online transactions. The most common method in the traditional evaluation system of e-business enterprises is time-accumulated credit evaluation, which evaluates the credit value by the cumulative average of the results of each transaction (Yoshino & Taghizadeh-Hesary, 2015). However, many businesses create fake transactions, leading to the deviation of credit evaluation. Due to the increasing uncertainty in the e-business trading environment, how to assess the credit of e-business enterprises more effectively is worth further attention.

Research on the existing enterprise credit evaluation system has put forward some improvement methods. For example, some scholars improved the accumulative credit evaluation system by considering the credit rating of the evaluated users (Piao *et al.*, 2007). The potential impacts of evaluated users' credit, transaction numbers, and amounts were discussed but lacked empirical tests. Some studies concerned about the information semantic recognition problem optimized the enterprise credit evaluation system through linguistic consensus model and fuzzy algorithm based on multi-attribute group decision-making theory (Chen & Yang, 2015; Li & Guo, 2021). Some studies focused on the enterprise default phenomenon, constructed specific indicators based on a multi-objective programming model to improve the credit evaluation system (e.g., Chi *et al.*, 2018). These findings are helpful to improve the credit evaluation in specific areas, such as the accuracy of language recognition of information. However, the evaluation system is relatively single and lacks dynamics.

E-business enterprise credit evaluation is different from general credit evaluation, which is specifically aimed at investigating, analyzing, and measuring the object's trustworthiness in electronic transactions. Due to the particularity of e-business, there are uncertain risks before the transaction, during, and after e-business transactions. The corresponding trustworthy behavior of the enterprise in each stage has a significant impact on the credit evaluation of e-business enterprises. However, traditional e-business rating systems less consider enterprises' long-term dynamic adaptability in pre-transaction and post-transaction stages.

Resilience, as an expression of the dynamic ability of an organization to adapt to the environment (Ortiz-De- Mandojana & Bansal, 2016), can well reflect the trustworthiness of an e-business enterprise in an uncertain environment. The perspective of organizational resilience theory provides a theoretical framework to better capture the evaluation index of e-business enterprise credit. Studies have analyzed the formation mechanism of organizational resilience at different stages from three dimensions of basic capacity, process, and outcome (Ortiz-de-Mandojana & Bansa, 2016). Facing risks in different stages, enterprises with high resilience have a good ability to adapt, recover and develop in an e-business environment. The findings in resilience literature suggest we consider the resilient related indicators in the evaluation system to better evaluate enterprise credit so as to improve the ability of enterprises to resist risks and uncertainties.

Accordingly, this study combines concepts related to organizational resilience and uncertain risks existing in each stage of e-business transactions and innovatively constructs an e-business enterprise credit evaluation index system. Based on the analytic hierarchy process (AHP), an e-business enterprise credit evaluation index system covering three first-level indicators and 13 second-level indicators is constructed. Empirical research was also conducted to test the validity of the model. Our study aims to provide an optimized approach for accurately evaluating the credit level of e-business enterprises and helping e-business enterprises to rectify defects and achieve sustainable development.

## LITERATURE REVIEW

### E-business Credit Evaluation System

A credit evaluation system, as a tool to disseminate credit information, helps to understand the credit status of the transaction parties, restrain the transaction behavior and reduce the transaction risk (Yang *et al.*, 2020). E-business credit evaluation is different from general credit evaluation. It is special for parties involved in e-business activities and assesses their trustworthiness. The special form of e-business business transactions demands that the evaluation system should have a procedural evaluation process, informative evaluation methodology, and timely evaluation results. Previous studies mainly explored the roles of enterprise's characteristics, external environment, and consumer factors in e-business credit evaluation system (Chen *et al.*, 2009; Gu *et al.*, 2017).

For the aspect of enterprise's characteristics. Previous findings mainly focused on the role of the financial index on credit evaluation (Abdou & Pointon, 2011; Chen *et al.*, 2009; Gama, 2012; Gu *et al.*, 2017). For example, some studies found the positive effect of enterprises' willingness and ability to repay a debt on their credit evaluation (Li & Guo, 2021). Besides, with the development of credit evaluation literature, more and more scholars are concerned about the non-financial index. For example, some scholars focused on the factors of previous credit, enterprise culture, organizational structure, and risk management ability (Abdou & Pointon, 2011; Hua, 2017). Some studies proposed that previous credit standing matters. The authors used the enterprise's loans and previous credit standing to evaluate the current credit (Chen *et al.*, 2009). In addition, managers play a significant role in the company. Empirical studies have been conducted to confirm the importance of managers for credit (Abdou & Pointon, 2011). Furthermore, some scholars are concerned about the factors about products and services, which have an impact on credit (Baesens *et al.*, 2003; Hazée *et al.*, 2020). These studies argue that these indicators can reflect the competitive ability and risk management ability.

For the aspect of the external environment, some studies concerned the factor about the economic environment, legal environment, credit environment, and industry environment (Delmas, 2002; Yoshino & Taghizadeh-Hesary, 2015). Generally speaking, a prominent macro environment is more favorable for building a credit evaluation system. In addition, some studies focused on the microenvironment, finding that the business category needs to be considered when evaluating an enterprise's credit evaluation system (Hua, 2017). Other studies also emphasized the importance of the justice of credit environment (Schuh, 2012). These studies help to understand the important potential impacts on an enterprise's credit from the stable and static perspective. However, it couldn't reflect the whole map for the e-business context.

For the aspect of consumer factors. Consumers, as an important part of e-commerce transactions, have a critical role in enterprises' credit evaluation (Munzel, 2016). Some scholars explored the impact on customer sharing, customer satisfaction, and consumer recognition (Hazée *et al.*, 2020). According to Hazée's work (2020), customer sharing represents the attitude of products and services, thus contributing to evaluating credit. In addition, some studies introduced consumer recognition into indicator systems, specifically measuring the sharing frequency and collection frequency to evaluate credit but lacked empirical tests (Sun *et al.*, 2015).

### Problem Identification

According to previous findings, the existing e-business credit evaluation system has some problems making it difficult to effectively reduce the evaluation bias. We identified the potential problems below.

#### *Deviation from the core features of e-business*

Compared with the traditional transaction process, e-business transactions have more uncertainty, which is determined by the special transaction form of e-business. Existing models are mainly concerned about the indicators of an enterprise's characteristics and external environment. These studies emphasized the role of financial factors such as asset-liability ratio (e.g., Gu *et al.*, 2017). However, they ignore the core feature and dynamic indicators in e-business transactions. Some scholars took consumer attitudes into consideration to solve this problem (Hazée *et al.*, 2020), but they do not have a segmentation of consumer

satisfaction at each stage and lack a dynamic process representation. So, the indicators which reflect the dynamic characteristic still need further improvement.

### ***Distortion of information***

Both empirical and practical evidence shows that deception is prevalent in the e-business credit evaluation process (Hua, 2017; Nick, 2016; Xiao & Benbasat, 2011). Some studies have explored ways to improve consumers' semantic understanding and information gain from the perspective of multi-attribute fuzzy evaluation, which helps to solve some of the information distortion problems (Kulak *et al.*, 2005), but it is difficult to address the credit speculation phenomenon. On the one hand, an enterprise may register multiple accounts to conduct fake transactions, which quickly enhances the credit evaluation. On the other hand, some consumers may also give a fake evaluation because of the enterprise's reward, resulting in distortion of credit degree. Some studies put effort into solving this problem. For example, some studies emphasized the consumer's reputation in the e-business environment (Munzel, 2016; Xiao & Benbasat, 2011) but lacked empirical tests.

### ***Lack of timeliness of evaluation***

Aside from the aspects mentioned above, the traditional e-business credit evaluation system uses the simple accumulation of the enterprise's credit through each transaction. But in fact, recent transaction indicators are of the greater reference value. Some studies called for that timeliness need to be considered in credit evaluation systems (Mansour, 2019). Therefore it is necessary to introduce more time-sensitive indicators in credit rating systems for e-business companies.

### **The Necessity and Feasibility of Bring Organizational Resilience Theory**

Resilience originated as a physical concept that refers to the ability to dynamically adapt to the environment (Brand & Jax, 2007). In recent years, resilience has been applied to different research fields, including psychology, ecology, engineering, economics, etc., spanning the research range from natural science to social science (Markman & Venzin, 2014; Ortiz-de-mandojana & Bansal, 2016). More and more scholars realized that resilience is the symbol of dynamic organizational capability which should be noticeable in the uncertain environment (Somers, 2009). The connotation of organizational resilience is based on the concept of development, which focuses not only on survival but also on dynamic sustainability through adaptation and learning (Miceli *et al.*, 2021). Some studies pointed out the importance of the three dimensions of a firm's basic capabilities, transaction processes, and outcomes in evaluating firm resilience. (Mark *et al.*, 2019; Ortiz-De-Mandojana & Bansal, 2016). The key connotation of organizational resilience theory provides an overarching framework for evaluating the dynamic process of e-business transactions. So, this paper makes a step on the existing e-business credit evaluation system from the perspective of organizational resilience theory.

Previous studies about resilience have been conducted, and some studies explored indicators of resilience. For example, some scholars introduced the degree of loss and recovery ability into a business resilience evaluation system (DesJardine *et al.*, 2019). Other studies concerned the factors about sales growth and financial volatility (Ortiz-de-mandojana & Bansal, 2016). Besides, Maria (2021) selected 29 non-financial indicators such as inventory levels to explore enterprises' resilience. These findings lay the foundation for this study to bring organizational resilience theory into an e-business context.

Accordingly, this study combines the characteristics of e-business transactions and the organizational resilience theory. We will comprehensively evaluate the credit of e-business enterprises from three main dimensions: representative indicators of overall enterprise capability before the transaction, time-sensitive key dynamic indicators during the transaction, and consumer feedback indicators after the transaction to improve the effectiveness of the evaluation. Our study helps to enrich the credit evaluation system research and expand the application of organizational resilience theory.

## **MODEL**

Based on the resilience theory and principles of index selection, considering the uncertainty factors in the e-business environment, we build the credit evaluation system in three dimensions: basic ability symbols, transaction process, and customer feedback about transaction outcome.

### **Principles of Index Selection**

The credit evaluation index directly affects the results of enterprise credit evaluation. Generally speaking, it contains credit evaluation elements and refines the evaluation content. Evaluation elements are limited to the general direction and are measured by a number of indicators. Based on the resilience theory, building enterprise credit evaluation system must follow the following basic principles:

**Relevance.** When selecting indicators, indicators that reflect little information should be deleted. For example, to reflect the Basic ability symbols, we select business year instead of the number of employees.

**Independence.** The building evaluation system should abide by the principle of independence. If there is a high correlation between the two indicators, they should be considered under the same first-level indicator, and the two first-level indicators should be independent of each other.

Pertinence. We need to set targeted evaluation indicators. Selecting indicators should reflect the content and purpose of evaluation. Based on the characteristics of e-business enterprises, this paper focuses on the enterprise credit evaluation from three aspects: pre-transaction, transaction, and post-transaction.

Availability. When selecting indicators, we should pay more attention to the availability of indicators. Considering the characteristics of e-business enterprises with light assets and heavy management, we will weaken financial indicators while strengthening non-financial indicators. Therefore, availability should be ensured in data collection.

Quantitative and qualitative combination. We adopt the principle of combining quantitative and qualitative indicators. Quantitative index and qualitative index are two types of credit evaluation index, respectively. Quantitative indicators refer to the data that can be expressed and calculated with specific figures, while qualitative indicators refer to the indicators that cannot be quantified. Combined with the two types of indicators, enterprise credit can be better measured.

### Build Credit Evaluation Index System

When selecting indicators, we combine previous credit evaluation systems and the background of e-business enterprises, fully considering the influence of internal and external factors, following the principle of enterprise resilience, build e-business enterprise credit evaluation system as shown in Table 1.

Table 1: Credit evaluation index of e-business enterprises.

| The indicator system                              | Level indicators                            | The secondary indicators  |
|---|---|---|
| Credit evaluation index of e-business enterprises | Basic ability symbols                       | Business years (A11)  |
|   |   | Trust pass years (A12)  |
|   |   | Past credit grade (A13)   |
|   |   | Transaction medal (A14)   |
|   | Transaction process                         | Repeat purchase rate in recent 90 days (A21)                                |
|   |   | Average delivery time in recent 90 days (A22)                               |
|   |   | Industry average ratio of cumulative Trading volume in recent 90 days (A23) |
|   |   | Refund rate in recent 90 days(A24)  |
|   |   | Industry average ratio of buyers in recent 90 days(A25)                     |
|   | Customer feedback about transaction outcome | Product quality satisfaction (A31)  |
|   |   | Return and exchange experience satisfaction (A32)                           |
|   |   | Logistics service satisfaction(A33)   |
|   |   | Response speed satisfaction(A34)  |

Source: This study.

In the evaluation system, considering the availability of data, we select three first-level indicators and 13 second-level indicators to reflect e-business enterprises' credit evaluation status. Among them, the first-level indicators include basic ability symbols, transaction process, and customer feedback about transaction outcome, which is elaborated in detail below.

First, basic ability symbols are the initial impression of the consumer. With the deepening of the transaction, although the consumer's perceived credit is constantly changing, the seller's initial credit can still reflect enterprises' strength, demonstrate corporate resilience, help consumers to evaluate the credit, and thus make better decisions. To measure the basic ability, we select four indicators: business years, trust pass years, past credit grade, and transaction medal. Business years refer to establishment time. The longer the business years, the stronger the continuous operation ability of the enterprise. Trust pass years refer to the length of membership of trust pass. Trust pass protects the rights and interests of consumers. Past credit grade is a set of standards launched by the Alibaba platform to measure corporate credit. It is divided into five grades, namely BB, BBB, A, AA, and AAA. To facilitate quantification, we assign 2, 4, 6, 8, and 10 points to each grade. Transaction medals are divided into five levels based on the transaction volume in the last 30 days. Similarly, this paper quantifies two points for each medal and so on.

Second, in an e-business transactions environment, the transaction of goods and the transfer of funds do not take place at the same time, so it leads to transaction risks such as refunds and delayed delivery. Transactions process indicators can provide consumers references to understand the transaction status to reduce purchase risk. To measure the transaction process, we mainly concentrate on six dimensions. Refund rate and delivery time in the transaction process reflect the unique characteristics of e-business enterprises. The repeat purchase rate and transaction volume in the last 90 days represent other consumer attitudes. The average industry ratio of accumulated transaction volume in the last 90 days is calculated by the number of transactions in the last 90 days divided by industry average trading volume. The calculation of the average industry ratio of the number of buyers in the last 90 days does the same.

Finally, consumer feedback about transaction outcomes is an important basis for repeat purchases, and it is critical for enterprises to achieve sustainable development. If consumer satisfaction is high, then the consumer perceived credit would increase, resulting in a higher credit score, which will help enhance enterprises' resilience. We measure by four indicators: product quality satisfaction, return and exchange experience satisfaction, logistics service satisfaction, and response speed satisfaction. They all represent positive correlation indicators. To facilitate the calculation, we assign 2, 4, 6, 8, and 10 points for each grade based on consumer evaluation.

**Determine Index Weight**

According to the above index system, we use the AHP method to determine the weight of each index. The analytic hierarchy process is to lists the factors related to the problem in layers. Usually, it can be divided into three layers, namely, the target layer, the criterion layer, and the scheme layer. Through calculation, we can obtain the weight value of the lowest layer relative to the highest layer and the optimal solution to the problem. Generally speaking, the analytic hierarchy process has three steps, that is, establish a hierarchy model, construct a judgment matrix, calculate weight, and consistency test. We will elaborate on this below.

**Establish hierarchical model**

In the above index system, we can regard e-business enterprises credit evaluation research as the target layer, and basic ability symbols, transaction process, and customer feedback about transaction outcome as the criterion layer. Other indices are the scheme layer.

**Construct the judgment matrix**

After completing the construction of the hierarchical model of the index system, we score the index according to the 1-9 scale method through pair-to-pair comparison. The specific scoring criteria can be seen in the following Table 2.

Table 2: Degree of judgment.

| Indicator importance | Equally important | Slightly important | Obviously important | Strongly important | Extremely important |
|----------------------|-------------------|--------------------|---------------------|--------------------|---------------------|
| $u_{ij}$             | 1                 | 3                  | 5                   | 7                  | 9                   |
| $u_{ji}$             | 1                 | 1/3                | 1/5                 | 1/7                | 1/9                 |

Source: This study.

Note:  $u_{ij}$  represents the importance of the former indicator relative to the latter indicator. In addition, 2, 4, 6, 8 represent the intermediate values of the above adjacent judgments.

**Calculate weight and consistency test**

In the calculation process, we can divide two steps, namely, calculate the weight of first-level indicators and consistency test and then calculate the weight of second-level indicators and consistency test. Here, we use the first-level indicators as an example to illustrate.

We compare basic ability symbols, transaction process, and customer feedback about transaction outcome in pairs and then use the 1-9 scale method. The resulting matrix is shown in Table 3 below:

Table 3: First-level index judgment matrix.

| Enterprise's credit                 | Basic ability symbols | Transaction process | Consumer feedback about transaction outcome |
|-------------------------------------|-----------------------|---------------------|---|
| Basic ability symbols               | 1                     | 1/2                 | 1/3   |
| Transaction process                 | 2                     | 1                   | 1/2   |
| Consumer feedback about transaction | 3                     | 2                   | 1   |

Source: This study.

We use the square root method to calculate the maximum eigenvalue and eigenvector and then normalize them to obtain the importance ranking of each indicator.

First, calculate the elements of each row of the judgment matrix  $M_i$ :

$$M_1=1/6, M_2=1, M_3=6$$

Second, calculate the square root  $W_i, n = 3$ :

$$W_1=0.55, W_2=1, W_3=1.82$$

Third, normalizing the vector, the feature vector is obtained:

$$W = (0.1632, 0.2967, 0.5400)^T$$

Fourth, calculate the maximum eigenvalue of the judgment matrix  $\lambda_{max}$ :

$$\lambda_{max} = \frac{1}{n} \sum_{i=1}^n \frac{(AW)_i}{w_i} \tag{1}$$

$AW$  is the product vector of the judgment matrix and feature vector, the result is  $\lambda_{max} = 3.0092$ .

To verify whether the weight distribution obtained by the above calculation is reasonable, it is necessary to conduct a consistency test on the judgment matrix. The test formula is:

$$CR = \frac{CI}{RI} = \frac{\lambda_{max} - n}{(n-1)RI} \tag{2}$$

The value of RI is 0.58, as shown in Table 4, and the result is  $CR = 0.0046 < 0.1$ . Therefore, generally speaking, the judgment matrix is considered to pass the consistency test.

Table 4: RI.

|           |      |      |      |      |      |      |      |      |      |
|-----------|------|------|------|------|------|------|------|------|------|
| <i>n</i>  | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    |
| <i>RI</i> | 0.00 | 0.00 | 0.58 | 0.90 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 |

Source: This study.

Note: *n* represents the number of indicators in the judgment matrix, and *RI* represents the average random consistency indicator.

Therefore, we can get the weight of each indicator and the ranking of the importance of indicators, as shown in Table 5.

Table 5: Weighting and ranking of first-level indicators.

| Enterprise’s credit                         | Final weight | Comprehensive sequencing |
|---|--------------|--------------------------|
| Basic ability symbols                       | 0.1632       | 3                        |
| Transaction process                         | 0.2967       | 2                        |
| Consumer feedback about transaction outcome | 0.5400       | 1                        |

Source: This study.

So, we can get the final result, which is shown in Table 6.

**Construct Comprehensive Evaluation Index**

In the process of calculating comprehensive evaluation value, each indicator has different dimensions. To eliminate the differences caused by different dimensions, normalization is first required to standardize all data between [0,1]. The specific processing steps are as follows.

For positive indicators:

$$a_{ij} = \frac{x_{ij} - \min(x_{ij})}{\max(x_{ij}) - \min(x_{ij})} \tag{3}$$

For the negative index:

$$a_{ij} = \frac{\max(x_{ij}) - x_{ij}}{\max(x_{ij}) - \min(x_{ij})} \tag{4}$$

Based on the data, combining the comprehensive index formula:

$$Y = \sum_{i=1}^n \sum_{j=1}^m a_{ij} w_{ij} \tag{5}$$

The composite index is obtained by multiplying the weight of each indicator by its value.

Table 6: E-business enterprise credit evaluation index system.

| The indicator system                              | Level indicators                            | First-level indicators Weight | The secondary indicators  | Secondary indicator weights |
|---|---|-------------------------------|---|-----------------------------|
| Credit evaluation index of e-business enterprises | Basic ability symbols                       | 0.1632                        | Business years (A11)  | 0.0195                      |
|   |   |                               | Trust pass years (A12)  | 0.0363                      |
|   |   |                               | Past credit grade (A13)   | 0.0327                      |
|   |   |                               | Transaction medal (A14)   | 0.0747                      |
|   | Transaction process                         | 0.2967                        | Repeat purchase rate in recent 90 days (A21)                                | 0.0530                      |
|   |   |                               | Average delivery time in recent 90 days (A22)                               | 0.0290                      |
|   |   |                               | Industry average ratio of cumulative Trading volume in recent 90 days (A23) | 0.0803                      |
|   |   |                               | Refund rate in recent 90 days (A24)   | 0.0699                      |
|   |   |                               | Industry average ratio of buyers in recent 90 days (A25)                    | 0.0645                      |
|   | Customer feedback about transaction outcome | 0.5400                        | Product quality satisfaction (A31)  | 0.2856                      |
|   |   |                               | Return and exchange experience satisfaction (A32)                           | 0.1185                      |
|   |   |                               | Logistics service satisfaction (A33)  | 0.0838                      |
|   |   |                               | Response speed satisfaction (A34)   | 0.0522                      |

Source: This study.

## EMPIRICAL TEST

### Data and Preprocessing

As the largest online trading market and e-business exchange community in China, Alibaba gathers a large number of e-business enterprises. We select 15 e-business enterprises on the Alibaba platform to collect data. To eliminate the differences caused by different industries, we choose the industrial about women's clothing. We use the symbols (C1-C15) to indicate. According to the index system, the raw data are collected, which is as shown in Table 7.

Table 7: Sample enterprise index system.

|     | A11 | A12 | A13 | A14 | A21 | A22  | A23   | A24 | A25   | A31 | A32 | A33 | A34 |
|-----|-----|-----|-----|-----|-----|------|-------|-----|-------|-----|-----|-----|-----|
| C1  | 1   | 2   | 8   | 10  | 27% | 1.27 | 9.71  | 13% | 10.54 | 6   | 8.6 | 8   | 10  |
| C2  | 1   | 9   | 8   | 10  | 16% | 0.4  | 12.58 | 15% | 17.93 | 6   | 8.8 | 6   | 8   |
| C3  | 2   | 2   | 8   | 8   | 17% | 0.9  | 7.21  | 9%  | 8.73  | 8   | 6   | 8   | 10  |
| C4  | 17  | 9   | 10  | 10  | 35% | 1.6  | 7.5   | 29% | 5.72  | 6   | 6.4 | 6   | 6   |
| C5  | 5   | 5   | 8   | 8   | 14% | 1.1  | 14.68 | 19% | 28.34 | 4   | 4.8 | 6   | 8   |
| C6  | 7   | 8   | 8   | 4   | 6%  | 4.9  | 1.29  | 39% | 4.29  | 4   | 6   | 4   | 6   |
| C7  | 1   | 3   | 8   | 8   | 42% | 1.04 | 2.12  | 10% | 6.09  | 6   | 8   | 8   | 8   |
| C8  | 5   | 2   | 8   | 6   | 13% | 1.46 | 0.34  | 11% | 0.89  | 6   | 6.6 | 8   | 8   |
| C9  | 1   | 6   | 10  | 8   | 14% | 6.2  | 8.82  | 57% | 16.14 | 6   | 7.6 | 4   | 6   |
| C10 | 2   | 1   | 2   | 4   | 23% | 7.7  | 0.08  | 4%  | 0.11  | 0   | 6   | 0   | 10  |
| C11 | 15  | 5   | 4   | 8   | 17% | 1.9  | 2.53  | 21% | 5.87  | 4   | 4   | 6   | 6   |



|     |   |   |    |    |     |     |       |     |       |    |     |   |    |
|-----|---|---|----|----|-----|-----|-------|-----|-------|----|-----|---|----|
| C12 | 8 | 1 | 6  | 4  | 6%  | 2.4 | 0.21  | 16% | 0.71  | 10 | 10  | 6 | 10 |
| C13 | 5 | 6 | 8  | 10 | 14% | 4.1 | 13.68 | 50% | 23.71 | 4  | 8   | 6 | 8  |
| C14 | 3 | 4 | 10 | 8  | 24% | 0.6 | 31.92 | 49% | 15.13 | 8  | 7.6 | 6 | 10 |
| C15 | 8 | 8 | 10 | 10 | 32% | 1.8 | 9.06  | 40% | 11.79 | 4  | 8   | 4 | 10 |

Source: This study.

### Application and Validity Test of The Model

According to the above calculation formula, we can obtain the comprehensive score and ranking of 15 enterprises, as shown in Table 8 below.

Table 8: Comprehensive score and ranking.

| Company Name | Comprehensive credit | Rank |
|--------------|----------------------|------|
| C7           | 0.7578               | 1    |
| C3           | 0.7251               | 2    |
| C1           | 0.7088               | 3    |
| C12          | 0.6713               | 4    |
| C8           | 0.6587               | 5    |
| C15          | 0.5903               | 6    |
| C6           | 0.5592               | 7    |
| C2           | 0.4962               | 8    |
| C9           | 0.4645               | 9    |
| C4           | 0.4406               | 10   |
| C13          | 0.3833               | 11   |
| C14          | 0.3718               | 12   |
| C11          | 0.3699               | 13   |
| C5           | 0.3339               | 14   |
| C10          | 0.2461               | 15   |

Source: This study.

### Evaluation Results

To make the analysis of evaluation result more scientific and reasonable, we use the method of cluster analysis to explain. The core idea of cluster analysis is to divide different clusters based on similarity or distance so that the similarity in the same cluster is as high as possible, and the difference between different clusters is as large as possible.

In this paper, we mainly use the k-means algorithm. By roughly dividing the credit evaluation score of these 15 enterprises, we divide them into four cluster centers and assign them into the most similar cluster. Therefore, we can obtain the following results through clustering.

Table 9: Final Clustering Results.

| Number | Company name | Cluster | Distance |
|--------|--------------|---------|----------|
| 1      | C7           | 1       | .027     |
| 2      | C3           | 1       | .005     |
| 3      | C1           | 1       | .022     |
| 4      | C12          | 4       | .031     |
| 5      | C8           | 4       | .019     |
| 6      | C15          | 4       | .050     |
| 7      | C6           | 3       | .069     |
| 8      | C2           | 3       | .006     |
| 9      | C9           | 3       | .026     |
| 10     | C4           | 3       | .049     |

|    |     |   |      |
|----|-----|---|------|
| 11 | C13 | 2 | .042 |
| 12 | C14 | 2 | .031 |
| 13 | C11 | 2 | .029 |
| 14 | C5  | 2 | .007 |
| 15 | C10 | 2 | .095 |

Source: This study.

According to the clustering results in the above table, we can obtain the following evaluation grades.

Table 10: Evaluation level.

|          |           |         |         |      |
|----------|-----------|---------|---------|------|
| Standard | >0.7      | 0.6-0.7 | 0.4-0.6 | <0.4 |
| Grade    | excellent | good    | medium  | poor |

Source: This study.

According to the clustering of 15 e-business enterprises, it can be seen that the comprehensive credit scores of C7, C3, and C1 are excellent. The reason for this result is that the refund rate in the last 90 days of these three enterprises is low, and the return rate in the last 90 days is high. The customer feedback is also generally prominent. Among them, the score of C7 is the highest. Through the data, we can know that the indicators related to customer satisfaction are all relatively high. Besides, the refund rate and repeat purchase rate perform better. Therefore, the comprehensive enterprise score is the best. The comprehensive credit scores of C12, C8, and C15 is good, compared with the enterprises with excellent scores, their customer feedback satisfaction is slightly lower, while the average industry ratio of buyers in the last 90 days, average industry ratio of accumulated trading volume in the last 90 days and refund rate in the last 90 days are far different from the enterprises with an excellent comprehensive credit score. It indicates that customer feedback satisfaction is roughly the same. The indicators related to the transaction process of the enterprise will directly affect the credit score of the enterprise. Among the remaining enterprises, we can see that the enterprises with medium and poor scores have significantly lower scores in two aspects: customer feedback about transaction outcome and transaction process. Among them, the comprehensive credit score of C10 was the worst. It is because that its product quality satisfaction and logistics service satisfaction scores are both 0, which is the root cause of its lowest score. At the same time, it also reflects the current e-business market is customer-oriented.

### Suggestion

Based on the above analysis of 15 e-business enterprises, we can see that resilience-related credit evaluation indicators are of great significance in enterprise credit evaluation. Therefore, the following suggestions are put forward for the above enterprises with low credit scores.

On the one hand, enterprises should take some measures to improve the repeat purchase rate and decrease the refund rate. It requires companies to focus on product quality. Specifically, enterprises need to form the consciousness of advanced prevention, process control, and supervision. Advance prevention means that enterprises should do their "homework" in advance, such as purchasing raw materials and choosing high-quality raw materials based on the principle of cost-effectiveness. Process control requires enterprises to integrate quality management into the whole process of production and operation and gradually reach the lean model of quality management. Supervision plays an important role, which directly determines whether the product is sold. If a large number of substandard products enter the market, then the life of the enterprise will be greatly shortened. So we need to improve the repeat purchase rate to enhance enterprises' resilience. In addition, enterprises should give some rewards to improve repeat purchase rates, such as giving preferential treatment to customers who repeatedly purchase.

On the other hand, enterprises should improve consumer satisfaction, including logistics service experience, return and exchange experience, and response speed experience. From the aspect of logistics service experience, enterprises can make efforts on the packaging of products. Then, enterprises can choose larger express delivery companies to cooperate with. Besides, enterprises should do a good job of logistics information follow-up work, ensuring that customers can timely and accurately obtain logistics information. From the aspect of return and exchange experience, enterprises should have a good attitude and inform the consumer of the detailed process, simultaneously asking why so that enterprises can improve next time. From the aspect of response speed experience, enterprises could be the system of working in shifts, trying to have someone available 24 hours a day.

## DISCUSSION AND CONCLUSION

### Theoretical and Practical Contribution

First, this paper contributes to the literature about e-business enterprise credit evaluation. The current evaluation system mainly uses the cumulative method to evaluate the credit of e-business enterprises. However, widespread phenomena such as credit speculation led to the deviation of evaluations. At the same time, problems such as lacking timeliness need to be solved. The dynamic capability perspective of organizational resilience provides a solution to this problem. Therefore, we build a theoretical model to evaluate enterprises' credit by considering organizational resilience theory and conduct empirical research to verify the model.

Second, this study makes an extension of organizational resilience theory. Organizational resilience theory emphasizes the ability of companies to recover, continue to survive, and sustain themselves after a shock. Studies have pointed out the important role of the three dimensions for organizational resilience assessment but lacks elaborate analysis of the three dimensions and index contents and empirical tests. This paper brings organizational resilience theory into the credit evaluation system to establish an adjusted credit evaluation model, expanding the application of the organizational resilience theory. At the same time, based on empirical research, our study finds that the indicators which represent consumer satisfaction and repeat purchase rate play an important role in evaluating the system. These findings make an extension of the content of the resilience-related indicators.

Aside from theoretical contribution, our study also has important practical implications for marketing strategy related to enterprises credit. First of all, the importance of corporate credit is to establish a corporate image and form a good reputation. Secondly, improving corporate credit helps companies to carry out economic activities and reduce the difficulty of obtaining financing, loans, and guarantees. Finally, enterprise credit evaluation helps enterprises to make scientific development plans, incorporate credit evaluation systems into enterprise development planning, and improve business management. From a practical point of view from the perspective of consumers, this research also helps to evaluate enterprises' credit and also helps people make more reasonable and rational decisions.

### Limitation and Future Directions

There are still some shortcomings in this research. First, this study focused more on the characteristics of e-business context and transaction process, so most indicators included in our model are non-financial indicators. However, it is also worth exploring whether the financial indicators would have any additional or interactive effects. At the same time, this study conducts the evaluation model based on the hierarchical analysis method. There is a strong subjectivity in scoring the indicators, and it is influenced by the inherent shortcomings of the hierarchical analysis method. This may directly affect the weight of each indicator. Therefore, the external effectiveness of indicators needs to be further verified. Finally, the empirical test is only conducted in the industry of women's clothing e-business enterprises. However, women's clothing e-business enterprises are a typical industry in an e-business environment. It is worth further testing the external validity of our findings and exploring the impacts of the indicators proposed in our credit evaluation model in other industries.

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